



FRIDAY, DECEMBER 29.

Contributions.

An Echo from the Rocky Mountains.

HELENA, Montana, Dec. 17, 1882.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your editorial of Nov. 10 having elicited already an unusual amount of comment and dissent, you must excuse if this echo from the Rocky Mountains comes in rather late.

As Mr. Robert L. Harris has very fully and ably set forth what appear to me correct views of the matter, there are but two points to which I wish to call special attention.

First, as to the number "who occupy prominent positions" in railroad construction and management, you say not one-fiftieth have had anything approaching a liberal education. If my observation in the profession for the period of over 37 years furnishes any basis for my opinion, I should say that more than half of that class are men of a liberal education. Especially is this true of those who have entered the profession during the last twenty or twenty-five years. Of the engineers with whom I have come in contact during the last fifteen years, although only a few have as yet become prominent, considerably more than one-half have been graduates, and they include much the most promising and useful members of the profession. To young men desiring to enter this profession, my advice has invariably been to first obtain a liberal education. For the encouragement of such I would say that of the resident engineers, assistant engineers and rodmen who are now climbing these mountain sides and going through these valleys, living in tents or log-cabins, it may be, but guiding and directing works on which vast sums of money are being spent and which will be "monuments more enduring than brass," nearly all are either graduates or are now seeking a little practice to enlighten their further studies.

The second point is in respect to your definition of success.

You appear to leave out of view all the higher and more inspiring motives of life, the love for noble work and great achievements and the love for personal distinction. They who planned the great works of antiquity surely did not do so to make money. The success of George Stephenson in building the "Rocket" was measured, according to your definition, by the prize of £2,000, which he fairly won; but how infinitely superior to that paltry prize was his success when measured by his fame or by the far-reaching material and social benefits conferred upon the human race! So the engineers who have laid out and constructed the great canals, the great railroads, the great tunnels and the great bridges of the present century have never thought of measuring their success by the money they acquired.

My friend, you do us wrong if you assume that we succeed only when we make money and that we enjoy nothing so much as what money will buy.

J. T. DODGE,

Division Engineer Northern Pacific Railroad.

The Education of Engineers.

The following article by Prof. Geo. L. Vose is copied from *The Tech*, a paper published by the students of the Massachusetts Institute of Technology in Boston:

In your issue of Dec. 6 you reprinted from the *Railroad Gazette* an article under the above heading, purporting to come from a "practical man," in which some advice is given to a young man who wishes to educate himself for the profession of civil engineer. As this advice is so entirely opposed to all advanced ideas in regard to technical education, and as it implies not only to the civil engineer, but to the mechanical engineer and the architect as well—and indeed to a person engaging in any industrial pursuit—I will accept your invitation to say a few words upon "the other side of the question." To put the article from the *Gazette* into a few words, it amounts to just about this: that while there are certain occupations, such as the making of surveys, the building of earthworks and masonry, the laying of rails, and the construction of bridges, the term "profession of civil engineering" is an absurdity, and we are gravely told that our technical schools are of little or no real value, and the young man is advised, after having obtained a very rudimentary knowledge of algebra, geometry and trigonometry, to "plunge into practice at once." If he wishes to learn how to locate a railroad, according to the *Gazette*, he should join a party of men who are engaged in railroad location; if he wants to learn about grading and masonry, he should find a contractor who is employed upon such work; if he wants a knowledge of bridge building, he can learn how to design and build bridges very much better by entering the employ of some firm in that line of business than he can in a technical school. Not only are we treated to this bit of wisdom, but we are told that "there is not a branch of civil or mechanical engineering now practised in this country in which the men who have achieved either the greatest distinction or pecuniary success have had a liberal education, either classical or technical;" and that "as a matter of fact, what can be learned in a common school is sufficient to enable a man to become eminent or successful in any branch of engineering;" and finally, that "so far as the achievement of success, i. e., making money by honorable means" (we won't stop to criticize this definition) "is concerned, the higher technical education is of little or no help."

To a person who has witnessed the rise and progress of technical education in this or in any other country, such statements are their own severest criticism. The so-called "practical man," who expresses such opinions, puts himself in direct opposition to the illustrious men of all countries who have placed themselves at the summit of the engineering profession. The world has never seen a man more skilled in the best engineering practice, or more interested in the elevation and thorough training of engineers, than the late William Fairbairn, of Manchester. "It is absurd," says Mr. Fairbairn, "to talk against theory, as if a knowledge of the exact sciences was a dangerous and useless at-

tainment. Nothing can be more erroneous than this impression, as on close inspection there is no practice without theory, any more than there is effect without a cause. In the useful arts theory can only be considered dangerous when it is not reducible to practice; and the real meaning of the term 'theory,' which creates so much alarm in the minds of practical men, is neither more nor less than a series of definite rules by which practice is governed, and through which we derive, from fixed and definite laws, those sound and definite results which of all others it is the primary object of practice to accomplish. In my opinion every one should be taught the rudiments and the higher branches of their professions upon the same principle that barristers and physicians are taught. All persons intended for the professional pursuits, in connection with the arts of construction, should have a theoretical as well as a practical education."

"It is notorious," says Mr. John Scott Russell,—"that certainly no better authority ever lived,—that the railways which have been made in the educated countries of Germany and Switzerland have been made far cheaper than those constructed by us in England. It is known that they have been made by pupils of the industrial schools and technical colleges of those countries; and I know many of these distinguished men who take pride in saying that they owe their positions entirely to their technical schools." "A young man," says a recent writer in the *Engineering News*,—"who wishes to attain success in the occupation of a civil engineer ought to begin by obtaining a sound technical education. The indications are that a technical education as a qualification for technical pursuits will grow every year more and more important, until finally it will become in this country, as it is now in Germany, indispensable." "The way to excellence in engineering, now," says a well-known English writer, "is not by promiscuous trial and by happy guess-work, but by carefully studying what has already been done. Formerly, the only education was that of actual experience. Now a large mass of experience has been digested, and general rules begin to appear. There is an immense advantage to be gained by attacking this mass of knowledge in a systematic manner, such as that in which it comes before the student in his course through a college. This is in truth the only manner in which anything like a complete mastery can be obtained. To attempt it by private study is to work at a great disadvantage. The engineer is the man to whom, more than any other, we owe the conquests that have been made within this century over material obstacles, the substitution of computation for guess-work, of definite knowledge and the clear purpose for confusion and blind groping. He has done much, and much remains to do; and he will do that best who brings to the work the formulated experience of his predecessors, and a firm grasp on the principles that underlie all practice."

Not only are the statements of the writer in the *Gazette* about fifty years behind the times, but they are grossly incorrect. To say that "there is not a branch of civil or mechanical engineering now practised in this country in which the men who have achieved the greatest distinction have had a liberal education, either classical or technical," is to show that the "practical man" never heard of Joseph G. Swift, William Gibbs McNeil, John Childs, George Whistler, David Douglass, Benjamin H. Latrobe, Charles Ellet, John A. Roebling, General Barnard, Totten, Alexander, Gilmore, and a host of others, who have been the pride and the ornaments of the profession in America; and if we look at the lives of Andrew Ellicott, James Geddes, Benjamin Wright, Canvass White, Gridley Bryant, and the other fathers of the profession in this country, we shall find them engaged in one long struggle, from youth to age, endeavoring to overcome that lack of knowledge of the theoretical part of engineering which is the very work of the technical schools to furnish.

Our "practical man" remarks that "so far as the achievement of success, i. e., the making of money by honorable means, is concerned, the higher technical education is of little or no help." It certainly is of no help to those who do not have it; but we have yet to see the man possessing a good technical education who would be willing to part with it. To see whether a good technical education has a "bread-and-butter" value or not, we have only to note how many of the best engineers in this country are filled by graduates of foreign technical schools. It is only a short time since an engineer of long practice and of fair ability, but of very limited education, expressed to the writer his very decided objection to the numerous graduates of engineering schools, who were, according to his statement, "stepping in ahead of older men, and taking all the best places."

Suppose we apply the advice of the *Gazette* to a young man wishing to become a physician. We should say to him, "Don't bother your head about anatomy; but if you want to be a surgeon, go to work with a man who is cutting off legs. Don't waste any time on materia medica; but if you want to practise physic, go to work with a man who is making drugs and mixing pills. Don't throw away years in studying physiology; but 'plunge into practice.' Don't avail yourself of the advice and counsel of the fathers of the medical profession; the accumulated experience of years is of no use to you; you are to deal with effects, not causes; you don't want principles; practice is what you need." How would this sound?

The advice of the *Gazette* is calculated to make good artisans, but not engineers; to make good subordinates, but not masters. The technical school is a product of the times. It arose to meet a pressing demand, and is every year making itself felt more and more. The courses of instruction have had their faults,—it would be very strange if it were not so; but these faults are rapidly being discovered and removed. The schools have, without the slightest question, been conducted in a manner too exclusively theoretical; but they are finding this out. They are coming to recognize the fact that the school has not only to lay a firm foundation in the general principles of engineering, but also to show the applications of those principles; to make the connection plain between theory and practice. If we consider the comparatively few years during which our technical schools have been in operation, we should rather be surprised at what they have accomplished than at what they have failed to do. They have now passed pretty well through the experimental stage, and are rapidly coming to that well-developed system which shall fully realize the intentions and the hopes of their founders.

[We shall have something to say in a future number in reply to some of the comments we have published in the article on the "Education of Engineers."—EDITOR RAILROAD GAZETTE.]

Locomotives for the St. Gothard Railroad.

The *Railroad Gazette* of Sept. 10, 1880, contained a very interesting description of this remarkable line. The question of the kind of locomotives to be used was very fully discussed before the line was opened, and *The Engineer* recently gave a condensed translation of a report on the subject made to the International Commission charged with the superintendence of the St. Gothard Railroad, by the

board of directors and the engineers. From this translation the following extracts have been taken, and the engravings are copied from the same paper. The report says:

In August, 1878, the directors appointed a committee to deal with the question of the best engines for the mountain section. It consisted of M. Bridel, now Chief Engineer; M. Urban, of the Grand Central Railway of Belgium, and Herr Cramer, locomotive builder at Innsbruck. Eventually these gentlemen gave in separate reports. M. Urban considers that the superiority of tank engines for steep gradients is indisputable. The objections to them, with one exception, apply only to those of a bad type. This exception is the limit placed to the amount of coal and water carried; but if a load of 7 tons per wheel is admissible, as on the St. Gothard, then it is easy to arrange for 6 cubic metres of water and 4 cubic metres of coal, which is sufficient for all circumstances. On the other hand, Herr Kramer, although admitting that tank engines are to be preferred, *a priori*, recommends on practical grounds the use of tender engines. Finally, Herr Bridel, after making a comparative study of an eight-coupled tender engine on one side, and on the other an eight-coupled tank engine, with leading axle uncoupled, concludes that an engine of the latter class could be built, which should draw 175 tons on a gradient of 1 in 40, with a coefficient of adhesion of .16, this being the best performance of the tender engines on the Southern Railway of Austria. He showed that by having coaling stations at each end of the mountain section sufficient supplies of fuel could be carried; that the uncoupled leading axle would cause very smooth running; and that the boiler could be large enough to give a performance equal to those on the Southern Railway of Austria. Nevertheless, Herr Bridel shrank from recommending the exclusive use of tank engines. His difficulties seem to have been, first, the loss of the tender brakes; secondly, the fact that most of the engineers he consulted were in favor of tender engines; thirdly, that, although tender engines had been thoroughly successful on several short inclines, they still had not been employed for main lines with long continuous inclines, such as the Paris & Mediterranean Railway, the Orleans Railway, the Alta Italia Railway, and the Southern Railway of Austria. He lent to the idea of ordering some tender engines at once, but obtaining full designs for tank engines, with a view to their employment at a later period.

On the other hand Herr Stocker, the Locomotive Superintendent of the St. Gothard Railway, was strongly in favor of tank engines, and was supported by other engineers, such as the superintendents of the Jura Railway, the Central Swiss Railway, and the United Swiss Railways, and Mr. Charles Brown, of Winterthur. They pointed out that the true reason why tender locomotives were preferred—for instance on the Southern Railway of Austria—was that it was necessary to have engines which could circulate over the whole extent of the line, in many parts of which the water stations were at long distances apart, as is not the case on the St. Gothard. The greatest difference in level between two water stations, those of Amsteg and Gurtellen, is 192.7 m.; whereas on other railways there are differences as great as 334 m. The experience with tender engines in Switzerland has been that they use more fuel and oil than tank engines, that they cause great wear and tear of the rails, and especially of the tires, and that at high speeds they are much more unsteady. Thus the Locomotive Superintendent of the Swiss Central Railway says that the line from Bale to Olten is worked entirely by tank engines, and by engines on the Engerth system, the experience with tender engines not having been favorable. Again, a report of the United Swiss Railways states that their new eight-coupled tank engines draw on the mountain section from Rorschach to St. Gall a train of 200 tons at 15 miles an hour, or 250 tons at nine miles an hour; thus they do more than double the work of their previous engines, and with a lower relative consumption of fuel and oil. Foreign railways using tank engines give similar testimony; e. g., the Werra Railway, the Bavarian State Railways, and the Grand Central of Belgium, the last of which has no less than 52 eight-coupled tank locomotives of the same type.

The directors have thus been induced to decide on trying tank engines for the St. Gothard on a large scale. They apprehend no difficulty from the mixture of types. The two types will, in fact, be equal as far as leading dimensions, power, &c., are concerned; many even of the smaller parts will be interchangeable. The tank engines will weigh 51,500 kilograms—say 51 tons—which is thus distributed: Weight empty, 37,000 kilograms; water in boiler and coal on grate, 4,500 kilograms; supplies of water and coal, 10,000 kilograms; total, 51,500 kilograms. The last item is higher by 3 tons than Signor Massa's estimate, so that they easily stand comparison with the tender engines in this respect. The total load on the three driving axles is 29,720 kilograms, while it is 42,000 in the tender engines. These loads are not too high for the heavy rails of the St. Gothard, and in fact the wear of rails is much more a matter of steadiness than of mere pressure.

With regard to tractive force, the difference between the two systems is that in the tank engine the coal and fuel add to the force of the adhesion, whilst with the tender engine they absorb part of the tractive power. This difference is of special importance on mountain sections, and forms a recognized advantage on the side of the tank engine. Signor Massa himself admits this, but considers that the absolute tractive force must be less. Now, in any engine there are two limits to the tractive force it can exert—one being given by the cylinder dimensions and by the steam pressure, the other by the adhesion of the wheels. On steep inclines the latter will generally be reached first, that is, it is easier to increase the engine power than to prevent the slipping of the wheels. The latter limit need therefore alone be considered. Now, at the beginning of the trip, if the two engines have equal loads per driving axle, their absolute tractive force is the same. But as the tank engine weighs 14 tons less than the engine with its tender, it will draw a train heavier by that amount. As the engine proceeds the fuel and water diminish in the case of the tank engine, and the adhesion weight also diminishes; whilst in the tender engine the weight to be drawn diminishes by the same quantity. Signor Massa compares the two engines at the moment when .4 of the fuel and water has been expended. In the tank engine he assumes the initial weight of these to be 7,000 kilograms, so that the total weight will now have been diminished from 48,000 to 41,000 kilograms. But of this total weight that available for adhesion was 38,500 kilograms, of which 4,500 kilograms was fuel or water. Deducting .4 of this, we have left an adhesion weight of 38,700 kilograms. The result is that the tank engine can still draw a train of 90.7 tons, as against 87 tons for the tender engine. To this must be added that in practice the tender engine will clearly take no heavier train than that which it can move at the beginning of the journey, when the tender is full. This gives a net weight of 83 tons. On the other hand, the tank engine, even when its coal and fuel are completely expended, can still draw a net load of 85 tons.

The present report gives a similar comparison to the above, but with some alterations which are unfavorable to the tank engine. The results are shown on two diagrams, one assuming the adhesion weight at starting to be equal, the other

that the tank engine has the advantage by two tons. In the former case the net weight drawn by the tank engine, diminishing during the journey, becomes before the end of the journey equal to the net weight at starting in the tender engine. In the latter case, except where the coefficient of adhesion is as high as one-sixth, the tank engine retains its advantage to the end. This, however, assumes that there is a continuous incline of 2.7 per 100 throughout the whole journey. This, of course, is not the case, and as a matter of fact it would always be possible on the St. Gothard to renew the coal and water before the diminution had passed the limit. Moreover, the smaller the coefficient of adhesion the longer it will be before this limit is reached; and therefore the tank engine is in the best position when the conditions of adhesion are the least favorable. The report further quotes some actual figures supplied by Herr Kramer, of the mail trains over the Brenner in 1878. On a gradient of 2.13 per 100 a train of 200 tons gross weight used 256 litres of water and 33.1 kilogs. of coal per kilometre, equal to 14 litres and 1.83 kilogs. per metre of vertical height. Again,

expenditure of water and fuel is not above 4 tons. On the whole, taking $\frac{1}{2}$ as the co-efficient of adhesion, it appears that the tank engine can surmount the worst approach, that on the south side of the tunnel, provided three stations only are supplied for coaling and watering. On the southern incline alone of the Mont Cenis the trains halt five times, stopping 63 minutes in all.

With regard to the weights to be drawn on the Mont Cenis, the following total weight is drawn daily in ten trains:

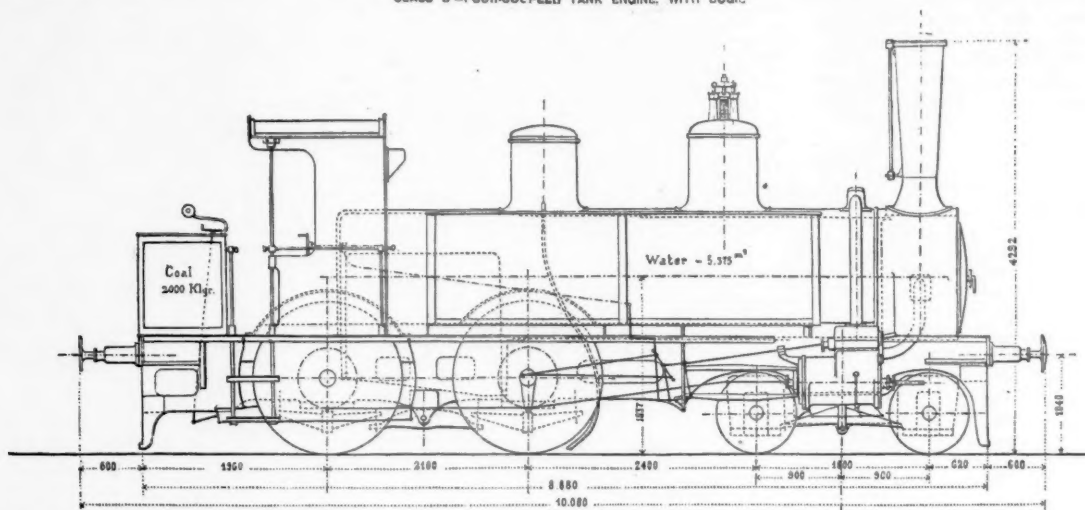
	Tons.
50 coaches at 6 tons.....	300
10 vans at 7 tons.....	70
15 goods wagons at $6\frac{1}{2}$ tons.....	97½
750 passengers at 0.075 ton.....	56
60 cattle at 0.5 ton.....	30
Baggage, etc.....	37½
Total.....	591

This gives a net average load of 59 tons exclusive of the

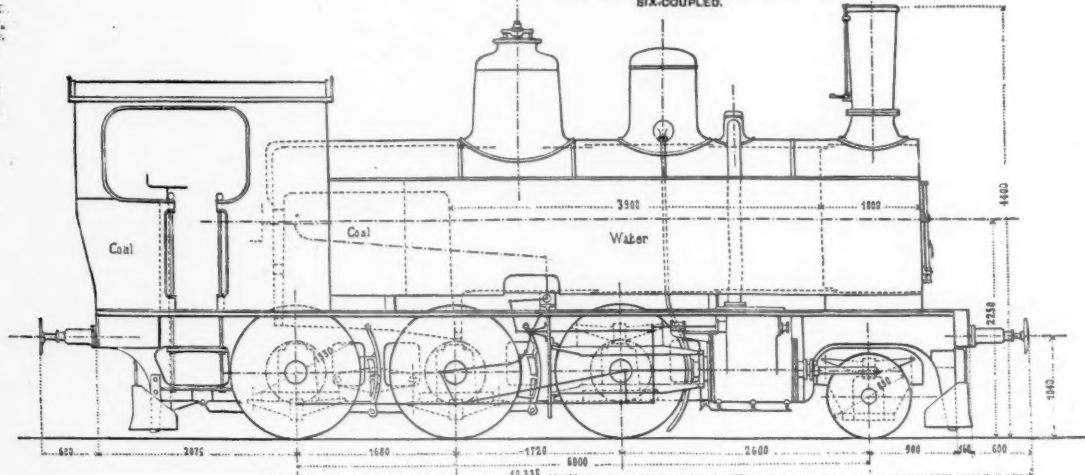
the objection to tank engines, on account of their smaller stores of water and fuel, is found in practice to have no weight however.

The report now goes on to consider the special advantages of the tank engine with uncoupled leading wheels. The tender engine has heavy overhanging weights, which cause very unsteady going, and rapid wear of the wheel flanges, and are, in fact, much more severe in their action on the road than the direct pressure of the load. On the Bern & Jura Railway four-coupled tank engines of Class A, with bogies, 13 tons load per driving axle, and 20½ ft. wheel base, have worked for 15 years with good results, and without any damage to the rails: while six-coupled tender engines, Classes B and C, with 12 tons load per axle, but only 12.2 ft. wheel base, have seriously damaged not only the rails but the sleepers. The superior stability given by the uncoupled leading axle is also recognized by the Swiss Central Railway. The fact that the load with tank engines diminishes as the journey goes on is here an advantage, since the pressure on the rails is thus gradually decreased.

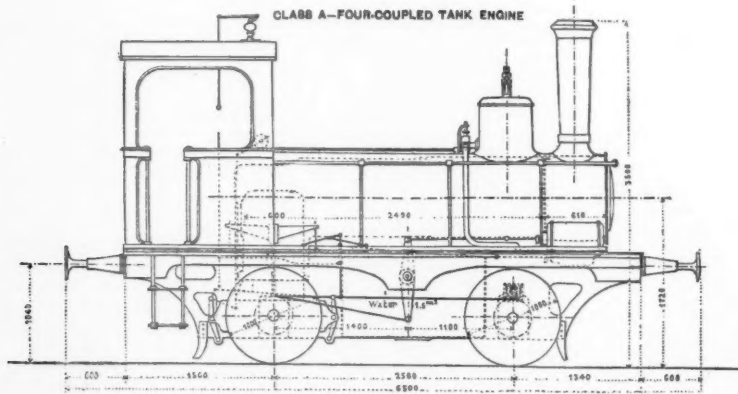
CLASS B—FOUR-COUPLED TANK ENGINE, WITH BOGIE



CLASS C—EIGHT-WHEEL TANK ENGINE, SIX-COUPLED



CLASS A—FOUR-COUPLED TANK ENGINE



PASSENGER LOCOMOTIVE FOR THE ST. GOTHARD RAILWAY

the Swiss Central Railway, on the line from Olten to Siffach, gives 1.6 kilogs. of coal for a train of 200 tons raised through one metre; and the United Swiss Railways, on the line from Rorschach to St. Gall, gives 14 litres of water for the same. The Bavarian States Railways are also in agreement with these figures.

On the St. Gothard line the heaviest work lies on the southern side, on the gradients of 2.7 percent. from Biasca to Giornico, 2.6 from Giornico to Fiesio, and 2.5 from Fiesio to Airolo. When the tender engine reaches the foot of the first of these, it has already expended 1.3 tons of fuel and water, and the net train load it can draw varies from 155 tons, with an adhesion of $\frac{1}{6}$, to 67½ tons, with an adhesion of $\frac{1}{3}$. This is the least favorable condition for the tender engine, and it must be compared with that of the tank engine. The diagrams show that the latter will have a greater net weight of train up to the point where it has expended 4.2 tons for an adhesion of $\frac{1}{6}$, and 8.5 for an adhesion of $\frac{1}{3}$. The whole expenditure from Biasca to Giornico, however, will not exceed 2.7 tons, and therefore it maintains a clear advantage over the tender engine. The same is found to hold for the two other inclines mentioned above. On the northern side things are still better. The distance from Erstfeld to Goschenen is only about 18 miles, and the

engine. But if the tank engine has expended all its stores, it has still an adhesion weight of 84 tons, which even with so low a co-efficient as one-ninth, gives a net train load of 84 tons. It is, therefore, amply sufficient at any rate for express trains, for which the net train weight may be taken at 55 tons.

With such trains the total expenditure of water, in traveling from Biasca to Erstfeld, would be 6.2 tons, and from Erstfeld to Biasca only 5.1 tons. It therefore appears that the latter trip might be made without stopping at all, and the former with a single stop at Airolo. It is, however, necessary to stop before entering the tunnel in either direction in order to see that the train is in good order. On the corresponding section of the Mont Cenis the express trains halt two or three minutes at Meana, the same at Chiomonte, six minutes at Salbertrand, three at Oulx, eight to fifteen minutes at Bardonnèche. There is, therefore, no fear of the St. Gothard express trains being longer on their journey than those of the Mont Cenis. With passenger trains and mixed trains the difficulties are of course less. This part of the report concludes with two quotations, one from Herr Petzholdt in the "Railway Handbook" of Hausinger von Waldegg, and the other from Herr Horn, Locomotive Superintendent of the Werra Railway, both of which state that

It has been observed that the unsteadiness of tender engines is not only a cause of great wear and tear, but even of serious danger, in cases where the track may be bad or the speed may become excessive. This danger is not sufficiently taken into account. Many of the Swiss engines are really unfitted for the maximum speed allowed to them.

Signor Massa had further called attention to the probable difficulties in ventilating the spiral tunnels. He suggested that the employment of a second engine in the rear might be thus rendered impossible, and it would be necessary to organize a more frequent service at higher speeds. But from this point of view the tank engine has a marked advantage, since the driver's stand can be entirely closed in, and the bad air thus excluded—a matter of special importance for the rear engine of the train. Finally, the question of economy, which is not an unimportant one, must be considered. It is admitted that the tank engine has a smaller dead weight in comparison with its tractive force; in fact, an express train weighing 55 tons may be hauled either by an engine and tender weighing 62 tons, or a tank engine weighing 48½ tons. The gross weight will therefore be 117 tons with the former, as against 108 with the latter, or per ton of engine weight, 2.13 tons as against 1.88. There is an advantage, therefore, in power of about 13 per

cent. on the side of the tank engine, with, at the same time, less wear and tear on the rails and tires.

This calculation is more than confirmed by the experience of Herr Horn, of the Werra Railway, which showed a saving by the use of tank engines with all wheels coupled varying from 18 to 42 per cent. Actual experience on the St. Gothard line itself for the years 1876 to 1879 gave the consumption of coal in kilograms per hour for the tank engines—Class A—and tender engines—Class B—as follows: From Biasca to Locarno, Class A, 4.91; from Biasca to Locarno, Class B, 6.90; from Lugano to Chiasso, Class A, 6.31; from Lugano to Chiasso, Class B, 7.47. The saving with the tank engines was 40 per cent. in the one case and 22 per cent. in the other, or about 30 per cent. in the mean. The net train weight was 60 to 65 tons, giving a gross weight of 90 tons with the Class A engines and 113 with Class B, or an advantage of 26 per cent. to the latter. This economy cannot be entirely attributed to the tank engines, but it is confirmed by the experience of other lines, especially the Jura Railway. Here in 1880 the consumption of coal per engine kilometre was 11.0 kilogram with tender and engine, and 9.54 with the tank engines, or per train axle kilometre 0.460 and 0.406 respectively. The lubricant used per engine kilometre was 31.6 grammes and 28.0 grammes respectively. The economy on the side of the tank engine is about 13 per cent. The two classes of engine were doing similar work, have equal wheel diameter and equal stroke; but the cylinder diameter is 450 mm. in the tender engines and 400 in the tank engines. Assuming a saving of 10 to 12 per cent. on the St. Gothard line, in which the fuel will

recommended, on the whole, the building of a class of tank engines; but that the number should be restricted to eight, this being the number which would find employment on the Monte Cenero line.

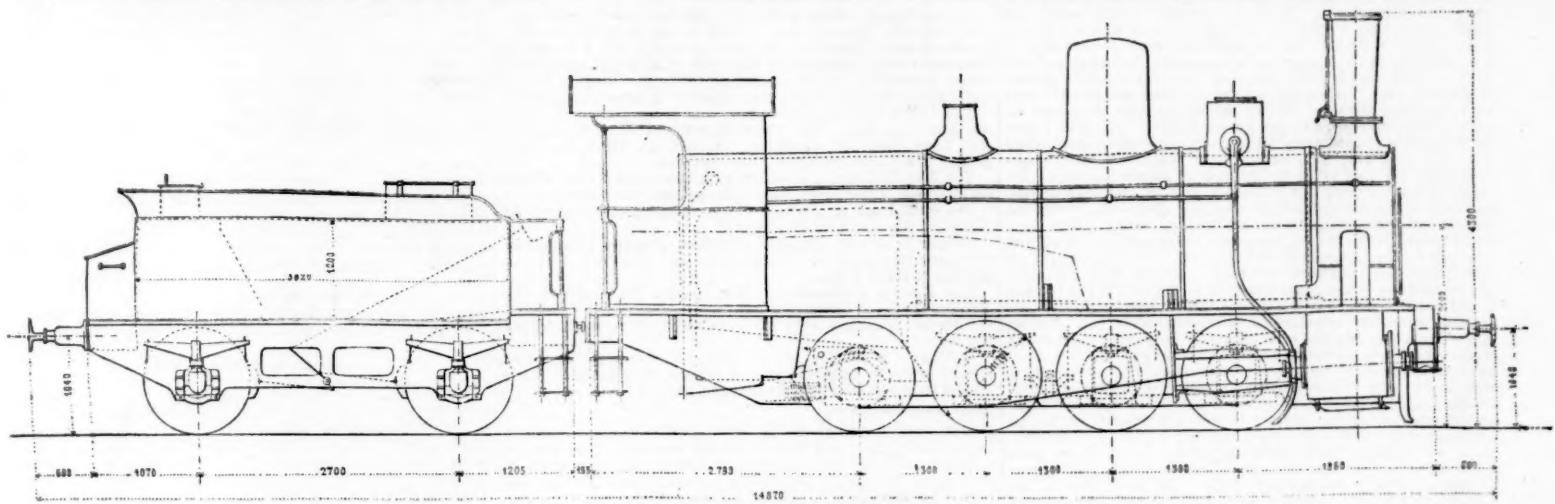
The question of tunnels, as pointed out by the late Max von Weber, becomes of great importance, for, owing to the damp, etc., in a long tunnel, the adhesion there is permanently reduced to about the figure usual in times of frost on an ordinary line. For this reason the gradient in the St. Gothard tunnels has been reduced; but this is not in itself sufficient, and careful inquiry on this head has been made by Herr Stocker on the Brenner, Mont Cenis, and other mountain lines. This has shown clearly the abnormal wear of rails in tunnels from frequent slipping, but at the same time the advantage gained by sanding, if with good sand, or by washing the rails with hot water, as lately introduced on the Jura and Hauenstein railways. From these results it follows that, in a tunnel rising 2.3 per cent., an engine at slow speed will draw a train of 150 tons. This corresponds to an adhesion of one-sixth on a gradient of 2.7 per cent., which is the steepest on the St. Gothard. The report, however, takes 125 tons the train load for a six-coupled, and 175 tons for an eight-coupled engine.

The final recommendation of the directors, which has been confirmed by the board of control, is to order eight tank engines with six-wheels coupled, Class C, and 15 tender engines with eight wheels coupled, Class D.

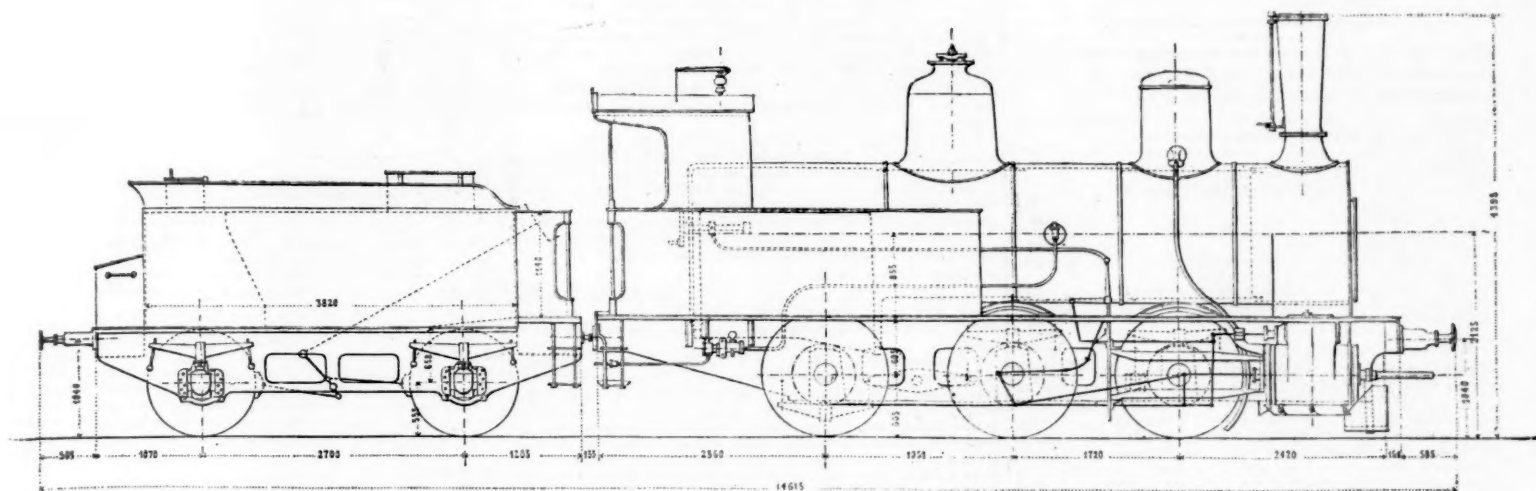
At the same time we give diagrams of the four main types of engine now under construction—as mentioned in the report—viz., eight-coupled tender engines (class D), six-

Peculiar People.

There is perhaps no other place in the city of Philadelphia to-day where human nature in all its varied phases can be better studied than at the Broad street station of the Pennsylvania Railroad Company. An hour spent there any night or day of the week will show the queer side of man, or woman either for that matter, in a light which makes one wonder where the ticket-sellers, ticket inspectors, special officers and trainmen manage to secure their stock of patience. Patience is something that the company does not allow to cease to be a virtue on the part of their employés, and in consequence every one, no matter how tiresome or exasperating, is sure of courteous treatment. Of course the immense number of incoming and departing trains from every section of the country must necessarily bewilder intending travelers and those waiting for friends or relatives; but it is not questions relative to trains that cause the hair of the men in charge to turn gray sooner than nature intended. Probably the greatest trouble occurs relative to excursion tickets, good for a certain number of days, or one day, as the case may be. The ruralist buys one of these pasteboards at his native station and overstates his time. He generally comes to the gateman after midnight, and makes a rush for the train, although it isn't in the shed, and nobody expects it to be there for an hour. Of course the stranger doesn't pass that gate. He is, as a rule, half full from extended practice at Philadelphia bars, and becomes terribly indignant. The gateman glances at the party's return pasteboard, and simply remarks: "Not good; that



Class D.—EIGHT-COUPLED TENDER ENGINES.



Class Cb.—SIX-COUPLED TENDER ENGINES.

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cost not less than £16,000 a year, this will represent the not inconsiderable sum of about £1,500 a year. This agrees very closely with the theoretical estimate made by Herr Abt, of the Swiss Railway Department.

Nor is this the only source of economy on the Jura Railway; the cost of maintenance and repair have been as follows, in francs, per engine kilometre:

	1876.	1877.	1878.	1879.
Tender engines, class C.....	.157	.106	.009	.081
Tank engines, class D.....	.082	.117	.074	.058

Again, the wear of the tires, which is greatly diminished by the use of the uncoupled front axle, becomes an important point, not only for the maintenance of the engine, but also of the road. Heavy and unsteady engines injure the sleepers so much as to render them unserviceable long before they become too rotten for use.

Although tender engines have hitherto been exclusively employed on mountain lines, there are indications in other quarters of a change in this respect. Herr Kamper, head of the Control Department of the Austrian Railways, has proposed for the Arlberg line six-coupled tank engines, with bogie in front, for the passenger trains, and tank engines all coupled for the goods trains. Again, the engineers of the Belgian Central Railway, which has 52 eight-coupled tank engines of the latter type—twenty of them as old as 1866—states that they consider them far superior to the tender engines of the Paris & Mediterranean Railway, which are more costly to maintain and give a less duty. Even if this type should prove unequal to the main work of the St. Gothard, no harm would result to the company, since they could be employed for the Monte Cenero section. This line, leading from Bellinzona to Lugano, is very similar in length and vertical height traversed to the line from Basle to Olten, which is regularly and satisfactorily worked by tank engines. For such lines, which are partly on the level and partly on steep inclines, an engine of this type, which can equally well run quickly over the former or slowly over the latter, is especially suitable. The directors, therefore, have

coupled ditto (class Cb), four-coupled tank engines with Bogie (class B), and eight-wheeled tank engines, six-coupled (class Ca). We also give a diagram of a new class of light

limit expired at midnight." He is used to such customers, and they do not worry him much. The holder always knows all about railroad law, or thinks he does, and insists that the

Principal Dimensions of Standard Locomotives, St. Gothard Railway.

	Class D.	Class B.	Class Ca.	Class C.	Class A.
Fire-grate—Length.....	7.0 ft.	4.75 ft.	5.90 ft.	5.90 ft.	1.97 ft.
Width.....	3.31 ft.	3.15 ft.	3.31 ft.	3.31 ft.	2.23 ft.
Surface.....	23 sq. ft.	15 sq. ft.	19.6 sq. ft.	19.36 sq. ft.	4.3 sq. ft.
Tubes—Number.....	225	150	207	207	69
Outside diameter.....	1.97 in.	2.1 in.	1.97 in.	1.97 in.	1.77 in.
Length between tube plates.....	13.78 ft.	13.18 ft.	12.79 ft.	12.79 ft.	8.17 ft.
Heating surface—Fire box.....	102 sq. ft.	78.5 sq. ft.	94 sq. ft.	94 sq. ft.	26.9 sq. ft.
Tubes.....	1,600 sq. ft.	936.0 sq. ft.	1,366 sq. ft.	1,354 sq. ft.	262.5 sq. ft.
Total.....	1,702 sq. ft.	1,014.5 sq. ft.	1,460 sq. ft.	1,448 sq. ft.	289.4 sq. ft.
Boiler—Mean diameter of shell.....	5.04 ft.	4.03 ft.	4.70 ft.	4.75 ft.	2.64 ft.
Total length with smoke-box.....	24.42 ft.	21.0 ft.	22.4 ft.	22.37 ft.	12.63 ft.
Height of centre line above rails.....	6.89 ft.	6.03 ft.	7.38 ft.	6.95 ft.	5.64 ft.
Pressure.....	149 lbs.	149 lbs.	149 lbs.	149 lbs.	178 lbs.
Frame—Thickness of plates.....	1.38 in.	1.3 in.	1.18 in.	1.18 in.	.39 in.
Axles—Diameter of journals.....	7.87 in.	5.75 in.	6.3 in.	7.87 in.	4.72 in.
Length of journals.....	9.45 in.	9.40 in.	9.40 in.	9.40 in.	7.10 in.
Wheels—Diameter of tread.....	3.84 ft.	5.18 ft.	4.26 ft.	5.24 ft.	3.28 ft.
Engine—Diameter of cylinder.....	20.4 in.	16.1 in.	18.9 in.	18.9 in.	8.66 in.
Stroke.....	24.0 in.	24.1 in.	25.2 in.	25.2 in.	1.38 in.
Diameter of crank pin driving axle.....	5.12 in.	3.97 in.	4.92 in.	.....	3.15 in.
Valve gear.....	.....	.....	.....	.....	.....
Weight—Empty.....	44.0 tons.	40.7 tons.	44.8 tons.	44.8 tons.	11.4 tons.
In working order.....	50.8 tons.	43.5 tons.	56.1 tons.	55.8 tons.	14.4 tons.

four-coupled engines (class A), which are now under construction, but are not included in the report.

We also publish a table which gives the principal dimensions of the engines referred to.

courts have decided an excursion ticket good until used. It always ends one way, however—he buys another ticket, takes a fifteen minute swear at the agent, threatens to sue the company, goes to sleep, and ten chances to one misses

the next train. Then there are the parties who come in on trains from the south about 3 a. m., and lack about 40 or 50 cents of the cash necessary to purchase a ticket for New York. They are generally women, those impecunious people, and usually have from one to five children with them. First these females will call for a ticket, and after it is stamped, blandly inform the man in the office that they cannot pay for it by a half-dollar or so, but will send it on to him after they get home. The company hasn't any charity fund for the purpose of making up deficiencies on through fares, and consequently the ticket isn't forthcoming. Then the woman tries persuasion, tries tears, and when both fail, berates the innocent vender of pasteboards for his stony-heartedness. The men around the depot would sometimes make up the cash needed by such parties when their cases appeared to be particularly pathetic; but, to use the expressive language of one employé, "We tumbled to that little racket, and salt water don't float cash out of our pants pocket any more." Limited through ticket-holders are another class who cause trouble by stopping off here and trying to take a New York, western or south-bound train after midnight of the day on which their ticket expired. These people always count three or more days from the one following "the date stamped on the back," whereas the company counts that day in. Sometimes it happens, however, that the ticket seller makes the mistake as to the limit. Then the holder, after indulging in a half hour's indignant talk, finds that if he had given the gateman a chance to talk long enough to explain things he would have been all right. All such persons have to do is to walk upstairs and get the proper date stamped on the ticket, and they can go through. Next in the class of bores comes the aged party, who insists on telling the man at the window how people traveled before railroads were invented, and who never fails to announce the important fact that he went to New York on the first train that ran over the old Camden & Amboy road, "when you had to go about half the distance by boats, you know." If the agent escapes a couple of such people, he is sure to get the nobby gent, who is on terms of the greatest familiarity with every high official connected with the road, and who attempts to paralyze him by announcing in a loud voice the number of shares he owns. He ought to have a pass, but he hasn't, and, of course, what he pays for his ticket will help to swell his dividend. Then he throws out a five with an air of "plenty more where that came from," takes the corporation's paper obligation to convey him to his destination and subsides. The day men fare but little better than their brethren on the owl turn, although in the rush for tickets and trains it is easier for the former to get rid of bores by not noticing their remarks, unless they refer to necessary information in relation to travel. Besides these traveling cranks and others, if anything somewhat worse, there are the women who refuse to pay fare for children, or insist that daughters taller than themselves shall ride on a half ticket; the man who takes the ticket office for the baggage room, and whom it usually takes ten minutes to convince of his error; people who insist on trains stopping at stations where the company say they shall not; those who imagine that a first-class ticket ought to be good for a seat in a Pullman car without extra charge, and dozens of others equally as exasperating. To the credit of the company's officials, however, be it said but few persons are ever insulted, and these generally cause such an indignity by their own actions.—Philadelphia North American.

Accidents on British Railroads.

The following table gives the number of killed and injured on the railroads of the United Kingdom and on their premises during the six months ending June 30, 1882:

Passengers:	Killed.	Injured.
From accidents to trains, rolling-stock, permanent-way, etc.	9	324
By accidents from other causes.	47	431
Servants of companies or contractors:		
From accidents to trains, rolling-stock, permanent-way, etc.	5	46
By accidents from other causes.	247	1,146
Persons passing over railways at level-crossings.	37	15
Trespassers (including suicides).	148	72
Other persons not coming in above classification.	29	38
Accidents which occurred on the premises of the railway companies, but in which the movement of vehicles used exclusively on railways was not concerned.	21	2,056
Total.	543	4,128

The following cases which did not involve any personal injury were also reported: 634 failures of tires, 228 of axles, and 230 of rails. Of the 634 tires which failed, 20 were engine-tires, 8 were tender tires, 7 were carriage tires, 17 were van-tires, and 582 were wagon-tires; of the wagons, 477 belonged to owners other than the railway companies; 548 tires were made of iron and 83 of steel; 33 of the tires were fastened to their wheels by Gibson's patent method, 8 by Beattie's patent, 5 by Mansell's patent, 9 by Drummond's patent, 583 by bolts or rivets, and 7 by various other methods; none left their wheels; 25 tires broke at rivet holes, 85 in the solid, 4 at the weld and 520 split longitudinally or bulged.

Of the 228 axles which failed, 136 were engine-axles, viz., 125 crank or driving, and 11 leading or trailing; 16 were tender-axles, 72 were wagon-axles, and 4 were axles of salt vans, 26 wagons, including the salt-vans, belonged to owners other than the railway companies. Of the 125 crank or driving-axles, 81 were made of iron and 44 of steel. The average mileage of 76 iron axles was 211,647 miles, and of 43 steel axles 184,844 miles.

What will strike the American reader of these statistics is the large number of breakages of tires and of crank-axles and also the fact that the average mileage of the iron axles which broke was greater than that of the steel axles.

THE SCRAP HEAP.

Locomotive Building.

The Schenectady Locomotive Works in Schenectady, N. Y., have received large additional orders for locomotives for the New York Central & Hudson River and the Canada Southern roads.

The Hinkley Locomotive Co., in Boston, has recently built several consolidation engines for the New York & New England road.

Car Notes.

Pullman's Palace Car Co. is making extensive preparations to go into the business of building freight cars at the Pullman works, and have already orders on hand for over 4,000 cars. Recent large orders have been obtained by the Pullman Co., enough to keep their shops at both Detroit and Chicago running for some months to come. The company is now commencing work on 10 dining cars for the Northern Pacific Railroad, which are to be ready in June. Six dining cars are to be built for the West Shore road, which will be ready in May. An order has been obtained from the Northern Pacific for 60 passenger coaches and 37 second-class

cars, which are to be delivered as soon as possible. Fifty passenger and 20 mail and baggage cars are being built for the New York, West Shore & Buffalo road, to be delivered between April and June. Six sleepers and parlor cars are also being built for the West Shore road. There are being completed 16 Pullman sleeping cars for service on the Atlantic Coast Line. These cars are to embody the latest style and ideas of the Pullmans.

The (Pittsburgh) American Manufacturer says: "John L. Gill, Jr., manufacturer of car-wheels, has become financially embarrassed, and an execution for \$50,000 has been entered against him. His liabilities are reported at \$170,000, largely secured by mortgages; the assets are nominally valued at \$220,000."

The Woodruff Car Trust Co. has been incorporated with an authorized capital of \$3,000,000, of which only \$150,000, or one-twentieth, is paid in, and with the following directors: James H. Hopkins, Wilson McCandless, Frank Rahm, all of Pittsburgh, and Henry Whelen, of Philadelphia. Trustees, Henry Whelen, of Philadelphia, and J. J. Donnell, of Pittsburgh. The new corporation will build or buy Woodruff parlor cars, and lease them to railroads, 10 years being given to pay for each car, annual payments being required with interest.

Bridge Notes.

Cofredo & Saylor, of the Philadelphia Bridge Works at Pottstown, Pa., have taken contracts for bridges over the Monocacy River, three spans, and the Antietam River, one span, for the Western Maryland road.

Iron and Manufacturing Notes.

At the recent annual meeting of the Oakdale Iron Works, held at Jenks, Tenn., it was decided to sell all of the property to the Oakdale Iron, Coal & Transportation Co., a company organized under the laws of the state of Missouri, and which lately purchased a controlling interest in the Walden Ridge Railroad, and also bought coal mines at Winter's Gap, Tenn.

The Coosa Furnace Co. is building a new blast furnace at Gadsden, Ala. The material is that of the furnace of the Vigo Iron Co., at Terre Haute, Ind., which has been pulled down, and transported to Gadsden.

The Ewald Iron Co. is running its Tennessee Iron Works on charcoal boiler plate, having large orders on hand.

The Ohio Iron & Steel Co. has rebuilt and enlarged its Mary Furnace at Leewardsville, O.

Cooper & Hewitt are rebuilding their Pequest Furnace in Warren County, N. J. The furnace has been raised 10 ft., making it 65 ft. high.

The Rosena Furnace, in New Castle, Pa., owned by Rhodes & Co., is being repaired and will be put in blast in a few days. This is a very large furnace, being 30 ft. across the bosh.

Witherow & Gordon, New Castle, Pa., the other day cast a 6½-ton steam cylinder and a 12-ton bed plate for the Union Iron and Steel Company, of Chicago.

The Rail Market.

Steel Rails.—The Iron Age says: "The market seems to be a shade firmer, and from what the manufacturers say it would be difficult to place an order now at less than \$40. A very large amount of business has been placed during the recent break in prices, and as there are still a great many inquiries, with prospects of a heavy consumption during the spring and summer months, makers are disposed to stand out for \$40 as a minimum figure. The only actual sales reported, however, were at \$40, delivered, supposed to net \$38.50 to \$39 at mill. Most of the mills are now pretty well supplied with orders, so that it is probable that the market will be somewhat steadier than it has been of late."

Old Rails.—The market is almost bare and quotations are nominal at \$27 per ton for tees in Philadelphia.

Young Men's Christian Association Railroad Branch.

On the evening of Dec. 21 the new building of the Association in Troy, N. Y., was opened for public inspection and was greatly admired. It is the largest and most elaborate of its kind in the country, costing \$10,000. It is expected that it will be dedicated next week, free of debt. The first subscription of \$500 was received a year ago from W. H. Vanderbilt. Cornelius Vanderbilt and other prominent men were expected at the formal opening last night.

Future Speed of Trains.

In a talk with Mr. John B. Peck, of the South Carolina road, last night, I asked him if he thought the next ten years' development would increase the speed of railway trains.

"Unquestionably," he replied, "I should not be surprised to see trains run at 100 miles an hour. This would carry a train from Atlanta to New York in less than 10 hours. It is simply a question of straight, double track, heavier rail, firmer ballast and larger driving wheels on locomotives. Already there are engines that have run at the rate of 78 miles an hour. On the South Carolina road, during summer, we have a daily train that is run 10 miles in 10 minutes and the passengers don't know it."

"A few years ago you would have considered a mile a minute an impossible rate of speed."

"It was impossible. The simple invention of the air-brake increased the schedule rate of trains fully 100 per cent. It made the stops shorter and made a high rate of speed safer. The introduction of hotel cars saves much time, as it eliminates stops for meals. So the putting of water troughs in the center of the track and postal cranes at the side of the track. The substitution of electricity for steam will be another step forward. In these fast days time is worth everything. I think you may hope to see the day when you can eat breakfast in Atlanta and supper in New York without any inconvenience from fast travel."—Correspondence Atlanta Constitution.

ANNUAL REPORTS.

Lake Shore & Michigan Southern.

At a meeting of the board of directors, held Dec. 22, a quarterly dividend of 2 per cent. was declared, payable on Feb. 1 next. The following is the statement which was presented at the meeting, December, 1882, being partly estimated:

	1882.	1881.	Inc. or Dec.	P. c.
Earnings	\$18,275,000	\$17,971,391	I.	\$303,609 1.7
Expenses	11,125,000	11,278,429	D.	153,429 1.4
Net earnings	\$7,150,000	\$6,692,962	I.	\$457,038 6.8
Interest, rentals and dividends on guaranteed stock	2,990,000	2,725,326	I.	264,675 9.8
Surplus	\$4,160,000	\$3,967,637	I.	\$192,363 4.8
Per cent. of exps.	60.87	62.70	D.	1.80

The surplus this year was 8.37 per cent. on the stock. The dividends paid are 8 per cent., amounting to \$3,957,320, leaving a balance of \$202,680.

The passenger, mail and express business shows a gain of \$800,000. The amounts received from these sources during the past three years are as follows: 1880, \$4,541,901; 1881, \$5,161,351; 1882, \$5,963,000. The Acting Treasurer reports operating expenses as including the cost of 12,014 tons steel rails and all other outlay for the maintenance and

improvement of the property. Nothing has been charged to construction account this year. The road and equipment have been fully maintained.

Canada Southern.

At a meeting of the board in New York this week the following statement was presented for 1882, December partly estimated:

	1882.	1881.	Inc. or Dec.	P. c.
Earnings	\$3,432,775	\$3,369,259	I.	\$63,516 2.5
Expenses	2,551,997	2,672,346	D.	118,349 4.4
Net earnings	\$880,778	\$696,913	I.	\$183,865 26.9
Mis. receipts	7,937	9,656	D.	1,719 17.2
Total	\$9,675	\$706,569	I.	\$200,166 28.3
Interest	679,088	678,625	I.	463 0.1
Surplus	\$227,047	\$27,944	I.	\$199,103 712.8
Per cent. of exps.	73.07	79.31	D.	5.34

The surplus was equal to 1.52 per cent. on the stock. Of the balance \$35,457.14 is appropriated to new side tracks, \$43,238.42 to new bridges and buildings, \$10,347.37 to new cars and \$15,235.55 to other purposes, leaving a surplus of \$123,308.26. Included in the operating expenses are \$77,310.10 for ties and rails, and \$87,070.51 for cars built and rebuilt.

Michigan Central.

At a meeting of the board of directors, held Dec. 22, a dividend of 2 per cent. was declared, payable on Feb. 1, next. The following is the statement which was presented at the meeting, December being partly estimated:

	1882.	1881.	Inc. or Dec.	P. c.
Earnings	\$8,950,000	\$8,934,332	I.	\$15,678 0.2
Expenses	6,525,000	6,732,096	D.	207,096 3.1
Net earnings	\$2,425,000	\$2,202,236	I.	\$222,764 10.1
In. and rentals	1,800,000	1,692,936	I.	107,074 6.3
Surplus	\$625,000	\$509,300	I.	\$115,600 22.3
Per ct. of exps.	72.90	75.35	D.	3.45

The surplus this year is equivalent to 3.33 per cent. on the stock; it is appropriated as follows: Dividend, 2 per cent., payable Feb. 1, 1883, \$374,764; construction, \$190,000; surplus, \$60,236. The operating expenses include \$550,000 paid for steel rails, \$15,000 for new locomotives and \$70,000 for new iron bridges. The construction expenditures included \$60,000 paid for terminal improvements at Detroit, Bay City and South Bend, \$40,000 for new stock-yards at Detroit Junction and about \$50,000 for new buildings.

Utica & Black River.

This company owns a line from Utica, N. Y., to Philadelphia, N. Y., 87 miles. From that point the road is extended to Morristown on the St. Lawrence River, 37 miles, by the Black River & Morristown road (leased) and further north to Ogdensburg, 10 miles, by the Ogdensburg & Morristown (nominally leased, but really owned). The Clayton & Theresa, Theresa to Clayton on the St. Lawrence, 16 miles, and the Carthage, Watertown & Sackett's Harbor, Carthage to Sackett's Harbor on Lake Ontario, 30 miles, are also leased and operated as branch lines. The total mileage worked is 180 miles. The report is for the year ending Sept. 30. The equipment consists of 22 locomotives, 27 passenger, 14 baggage and 381 freight cars, an increase during the year of 4 passenger, 4 baggage and 104 freight cars.

The general account is as follows:

Stock	\$1,772,000.00
Bonds, 7 per cent.	1,112,000.00
Bills and accounts payable	55,830.50
Surplus	424,624.00
Total	\$3,363,444.50
Road and equipment	\$2,983,005.80
Leased lines, stock and bonds	131,800.00
" advances	126,615.10
Cash and cash items	122,023.60
Total	\$3,363,444.50

There was no increase in the stock or bonds during the year. The cost of road and equipment was increased \$104,303.14, of which \$79,073.20 was for new equipment; the balance was expended on account of new machine shops at Utica and renewal of three bridges with iron. The amount of stocks and bonds of leased lines held was decreased by the sale of \$57,000 Clayton & Theresa bonds, realizing \$65,865. The advances to leased lines were increased by \$1,463.54 expended on improvements of Black River & Morristown, \$2,953.56 taxes paid for account of Clayton & Theresa and \$200 for land purchased for the Ogdensburg & Morristown road. Surplus earnings of the Carthage, Watertown & Sackett's Harbor reduced that company's indebtedness \$2,495.04. The net increase from advances was \$2,092.06.

The traffic for the year was as follows:

	1881-82.	1880-81.	Inc. or Dec.	P. c.
Passengers carried	257,236	289,541	I.	32,305 12.6
Passenger miles	7,377,199	8,593,023	I.	1,215,824 16.6
Tons freight moved	199,383	221,987	I.	22,604 11.4
Ton-miles	12,913,373	15,224,870	I.	2,306,497 17.9

Av. receipts: Per pass.-mile 3.23 cts. 3.36 cts. D. 0.10 3.00

Per ton-mile 2.93 " 3.17 " D. 0.24 7.57

The decrease in rates was general on all classes of business.

The earnings for the year were as follows:

	1881-82.	1880-81.	Inc. or Dec.	P. c.
Passenger	\$280,632	\$248,154	I.	\$32,478 13.1
Freight	444,006	410,038	I.	33,968 8.4
Mails, etc.	41,225	34,928	I.	6,297 15.3

Total	\$766,463	\$693,120	I.	73,293 10.6
Expenses	443,451	446,390	D.	2,939 0.7

Net earnings	\$323,012	\$246,730	I.	\$76,282 31.0
Gross earnings per mile	4.258	3.851	I.	.407 10.6
Net earnings per mile	1.795	1.371	I.	.424 31.0
Per cent. of expenses	57.85	64.40	D.	6.54

The low proportion of expenses this year as compared with 1880-81 is accounted for by the fact that 1,500 tons of steel rails and fastenings, a new depot building and other expenditures, amounting in all to nearly \$60,000, which should have been included in this statement, had not been delivered at the close of the year.

The income account was as follows:

Net earnings as above	\$323,011.66
Interest, rent, etc., received	8,767.73
Premium on sales C. & T. R. R. bonds	14,565.00
Total	\$346,344.39

Car., Wat. & S. H. R. R. proportion of earnings	\$24,407.48
Interest on bonds, etc.	129,960.00
Dividends, 5 per cent.	88,000.00
Surplus for the year	\$103,346.91
Surplus, Sept. 30, 1881	320,277.09
Surplus, Sept. 30, 1882	\$423,624.00

Included in interest payments as above, are \$24,650 on \$495,000 7 per cent. Black River & Morristown bonds, and \$14,000 on \$200,000 7 per cent. Clayton & Theresa bonds.



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EDITORIAL ANNOUNCEMENTS.

Passes.—All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.

Addresses.—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed EDITOR RAILROAD GAZETTE.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subject pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

THE YEAR 1882.

The period of rapid growth in prosperity which began, according to our reckoning, with the harvest of 1877, and culminated, according to present appearances, in 1880, suffered serious interruption by two events in 1881, the first artificial, namely, the trunk line railroad war which raged through the last half of that year and was felt through the first half of this; the second natural, namely, the unusually light yield of all the principal crops in almost all parts of the country. The shock so occasioned in itself could have but a temporary effect. At a time of general stagnation of business it might have caused general disaster, and a considerable prolongation of the prevailing stagnation; after a long period of excessive activity, it would probably have precipitated a panic. But the bad crops came after four successive exceptionally productive seasons; and the farmers were then so prosperous that they were well prepared to meet considerable losses. Their surplus accumulated in four prosperous years was such that they apparently hardly restricted their expenditures at all in consequence of their losses in 1881. The demand for merchandise was better, probably, during the crop-year following the harvest of 1881 than ever before. And the railroad war also, which caused a reduction in profits to the several railroads affected of many millions of dollars, reduced still more the market value of railroad shares, and caused such distrust with regard to investments in new railroads as had not existed for some years, at any other time than after a period of great prosperity among the railroads would probably have given a great check to railroad construction. Coming as it did, however, when every industry was in the full flush of profitable activity, and preparations had been completed and capital already subscribed for constructing many thousands of miles of railroad, this railroad war did not check construction in 1881 at all, apparently, and but little in 1882—at least these are precisely the two years in which most railroad was built—about 9,500 miles in 1881 and probably 12,000 in 1882. But this event and the bad crops together had more effect than we see in these figures. We could not have built much more railroad in 1881, because we could hardly have got the men and materials to build them with; we would have built even more than we have in 1882, if capital had been as easy to get for such purposes during and after as before the railroad war and the bad harvests. Indeed, we are very much inclined to

think that but for these two great disasters—and they were among the greatest disasters in their effect on business that we have ever had to chronicle—we should have pursued railroad and other building at such a rate during the past 18 months that we would by this time be close on the edge of a financial crisis like that of 1873. If they saved us from such a crisis, or indefinitely postponed one, they were blessings in disguise.

The great industry of this country is agriculture: that, the production of petroleum and the mining of precious metals are the only ones which afford us an important export trade. Taking long periods of time, the prosperity of the country, and therefore of the railroads, depends upon the growth and prosperity of agriculture. If it grows rapidly, and the farmers make good profits, then there is a good demand for all our manufactures. Comparatively, there is unlimited room for agriculture to grow, for it has the world for a market. But for our manufactures, speaking generally, there is no room for rapid growth left when they have been extended sufficiently to meet the home demand.

Now the actual course of industry in this country seems to be something like this: There is for a few years a rapid growth of agriculture; the area under cultivation is extended; exports of grain, provisions and other farm products increase greatly; during the early years of this period, and perhaps for some time before, there is little growth in other industries, but the increase in the population seems to be devoted almost entirely to farming. With good seasons and high prices this great body of the population buys freely; prices rise; manufacturing, because of the growing demand and high prices, suddenly becomes very profitable; there is then great eagerness to share these profits and new works are established and old ones are enlarged; at the same time there are great additions to the numbers of buildings and the mileage of railroads, and in this way an unusual proportion of the labor of the country is engaged in works which transfer floating into mixed capital. This great activity in manufacturing and building employs a large amount of labor that otherwise would be devoted to agriculture. Agriculture may grow, but it grows much more slowly than other industries, while these other industries depend entirely upon the growth of agriculture for employment, while agriculture does not depend upon them. We thus have the most rapid growth of manufacturing and building just at the time when there is less than the usual occasion for it—that is, when agriculture is growing more slowly than usual. The demand for manufactured goods having increased at the rate of 15 or 20 per cent. a year for two or three years, capitalists within a short time increase the capacity of the works enough to supply the demand two or three years hence on the supposition that this rate of growth in the demand will continue. But meanwhile these very works attract so many workmen that agriculture cannot grow so fast as usual; one or two seasons of bad crops or low prices come, and agriculture scarcely grows at all, while the factories begun when trade was good are being completed and prepared to add to the production of goods. We have then a great amount of capital invested beyond real in works for whose product there is no demand here, and which usually cannot be exported, because the cost of production is greater here than elsewhere. If the diversion of capital and labor from agriculture to other industries has been so great that a very large proportion of the capacity of the works cannot be utilized, we have a panic. The resources of the country are misapplied, and it requires time to readjust them.

Now we were taking this course, and we cannot yet say that we are not pursuing it still. The impulse given to industries first by the prosperity of the farmers was afterward increased by their own expansion—by the demand for materials, tools, etc., for the extension of such industries—and by the great amount of new construction and of other building. In spite of an immigration which has no parallel in history, labor became scarce, and in spite of the opening of much new territory by new railroads the growth of farming industries became moderate. This is a fact generally ignored, and it is hard to make people believe it; but the reports of the Department of Agriculture, which showed an increase in the acreage of cereal crops amounting to 24 per cent. from 1872 to 1875, and of 21½ per cent. from 1875 to 1878, exhibit an increase of less than 9 per cent. from 1878 to 1881, and of 10 per cent. from 1878 to 1882. For the six years ending with 1878 the average yearly increase in the acreage of these leading crops was 8½ per cent.; for the four years since 1878 the average yearly increase has been 2.2 per cent. The growth in cotton cultivation has been more rapid until this year, when

there was a decrease from 16,851,000 to 16,277,000 acres—3.4 per cent.*

We have called attention to this comparatively slow growth of agriculture before; but it can hardly be dwelt upon too much if we would understand the true economical situation of the country and the future course of business for which we must provide. It will be useless, and worse than useless, to provide factories and railroads to serve an agricultural population increasing at the rate of 100 per cent. in 12 years, if that population is now increasing only at the rate of 100 per cent. in 45 years. And it will be of little avail that Minnesota and Dakota are growing fast if the rest of the country is standing still, or that the requirements of the armies of men building new railroads and mills, and making machinery for them, have at this time given all industries plenty to do. A stop will have to be put to this, unless the farming industry grows enough to give work to all these enterprises.

There can be no question that the growth of many industries has been altogether out of proportion to the growth of agriculture of late years, and most of all, perhaps, the growth of the railroad system. The check given by the disasters of 1881 has perhaps prevented any great convulsion, but it has not yet started us on the right road. Apparently a great check has been given to the establishment of new industrial enterprises of nearly all kinds, including railroads; which will of itself cause stagnation in some industries unless the labor diverted from these industries, of which we are beginning to have too many, is not turned to agriculture, which we cannot well overdo so long as we have the whole world for a market.

We have no sufficient statistics of industries other than agricultural to say just how much they have increased, or which of them have been overdone. There is a vast number and variety of such industries, and not all have grown alike, and some doubtless none too much to supply the demand. We usually only learn that there are too many works of a given kind by the closing of some of them, or a reduction of prices below cost. But there has been in the last half of this year apparently a general conviction that, however well the various industries might be supplied with work just then, it would no longer be safe to extend them as fast as for three or four years past, and in respect to railroad construction this conviction seems to be general, at least with the capitalists who provide the means for building new railroads, although so far the new railroads seem to have done pretty well, and there has been no great financial disaster to any company building them. Although the construction during the year has been entirely unprecedented here or in any other country (the length built in this year being about two-thirds of the entire mileage of Great Britain), it is said that it is now almost impossible to get capitalists or their representatives to listen to a proposition to take part in any new railroad enterprise. There is a great deal of work in hand, however, some of which makes slow progress because of the difficulty of getting money, but for most of which means seem to have been provided already.

The year opened with the trunk-line war raging. In January, or before, contracts were made by which the chief shipments from the seaboard cities to the principal Western towns were carried until July at less than half the rates that had prevailed the year before and for years before that. Then, too, west-bound rates were at their lowest, and the immense shipments from Chicago in January were carried probably at an average of not far from 10 cents per 100 lbs. to New York—some as low as 8 cents. Near the close of the month this disastrous contest was brought to a close; passenger rates were restored immediately and freight rates as soon as existing contracts permitted—on most west-bound shipments not till July, but on most east-bound perhaps as early as March. The settlement of this war was the occasion of extending the division of business theretofore made by the trunk lines to east-bound as well as west-bound freight and passenger traffic, and of changes by

* As most people seem to believe that the growth of agriculture has been faster than usual and not slower than usual of late years, we subjoin the figures (corrected for the years previous to 1879 in the light of the census) for the acreage of cereal crops for 12 years and of cotton for seven years:

Year.	Cereals.	Cotton.
1871.....	66,100,000	.....
1872.....	70,100,000	.....
1873.....	77,820,000	.....
1874.....	86,538,000	.....
1875.....	94,100,000	.....
1876.....	103,312,000	11,541,000
1877.....	104,038,000	12,223,000
1878.....	114,400,000	13,200,000
1879.....	118,665,000	14,388,000
1880.....	120,926,000	16,120,000
1881.....	123,388,000	16,851,000
1882.....	125,775,000	16,277,000

It should also be remembered that the aggregate yield of grain last year, when the yield was good, is estimated to be only about the same as in 1870 and 1880, while the population within the three years has increased at least 10 per cent.

which the agreements of the roads with each other may be enforced. Owing to the poor crops, there was a very light movement of farm produce after the railroad war, but there was a general activity in manufacturing and mining, and especially in the iron industry, a good demand for merchandise, and an unprecedented immigration, which greatly added to the traffic of many roads, including some of those which suffered most by the railroad war.

Considering the crops, the traffic and earnings, even in the first half of the year, were greater than could have been expected, or would have been possible had not the country been in the full career of industrial prosperity when the bad harvest came—if there had not been four exceptionally good harvests behind that very bad one. Sixty-six roads which reported earnings for the first half of the year had a decrease in the average of only $\frac{1}{2}$ per cent. in earnings per mile. Since August they have shown a considerable increase in earnings not only over last year, but in most cases over 1880 also, and for some months traffic has been generally satisfactory in nearly all parts of the country, as is illustrated by the returns of the Western Vanderbilt roads, which we discuss this week, and also by the magnificent and entirely unprecedented earnings and profits of the Pennsylvania Railroad Company—these roads reflecting the general condition of traffic in the country better than almost any others that have reported. Rates on trunk-line traffic, including freight and passengers in both directions, have been better maintained in the last half of the year probably than ever before, though on freight the agreed rates have been unusually low. There have been some difficulties among the Western roads from time, but nothing serious except the four weeks war among the roads carrying from St. Paul and Minneapolis to Chicago, which began Nov. 19, and ended by the transfer of the central St. Paul & Omaha Company to persons who will work it in close connection with the Chicago & Northwestern. Other traffic arrangements of importance, besides the reorganization and extension of the cooperation of the trunk lines and their connections in the "Joint Executive Committee," were the agreement between the trunk lines and the roads in the Western Trunk Lines Association for the more economical conduct and the equitable distribution of the immigrant traffic, which was first made last spring and was revised and extended recently to cover the business of the coming year; also the organization of several Western associations controlling the traffic between Chicago and Omaha, between Chicago and Central Iowa towns, and between Chicago and Milwaukee on the east and St. Paul and Minneapolis on the west, the latter completed only after the St. Paul railroad war. There was also a reorganization of the Colorado traffic association and doubtless scores of combinations of which no record is made, it now being common for railroads to agree formally as to the division of traffic or at least the rates at common points.

There has been no such number of consolidations of railroads as occurred about the year 1880, but there have been some important ones, such as the union of the Grand Trunk with the Great Western of Canada, which took place last August, and the union of the Michigan Central with the Canada Southern, which goes into effect Jan. 1. The Erie Company has, however, obtained control of the Cincinnati, Hamilton & Dayton and the Chicago & Atlantic companies, and made long traffic arrangements with several coal roads, which have some of the effect of a consolidation. The Vanderbilt interest has secured the Indianapolis & St. Louis road, which gives it control of a line from Cleveland to St. Louis, and of the New York, Chicago & St. Louis road between Buffalo & Chicago, giving it three different lines between these two places. The union of the railroads southwest of St. Louis had been made before 1882, and in the South there was not much chance for consolidation left. In the Northwest there have been some transfers of lines, but none very important except the transfer of control of the St. Paul & Omaha, which brings it under the management of Chicago & Northwestern officers. In the East, steps have been taken which will result, it is thought, in the union of the Eastern and the Boston & Maine companies, but nothing is effected as yet. The Delaware, Lackawanna & Western has leased the new road from Binghamton to Buffalo which was built for that purpose, but by another corporation.

The great amount of railroad construction during the year we have referred to. This for two years has been the most threatening feature in the business situation of the country. Work could not possibly be continued at that rate without bringing on financial disaster. The 104,000 miles of railroad which we had at the beginning of the year has probably been made

about 116,000 miles at its close. There is at this moment probably 54,500,000 people in the United States, and about 1,800,000 more than a year ago, about 800,000 of the increase being by immigration. At this rate—and this is the most rapid growth of population so large a country ever had—there were 507 inhabitants per mile of road at the beginning of the year, and only 470 at the end of it. It needs no prophet to tell what will be the result if we keep on in this way. There has been, however, for many months comparatively little new construction begun; the great work of the year is almost entirely on lines which were begun or prepared for early in the year or last year. Among the lines built and undertaken are several which will compete for the trunk-line traffic between the East and the West, and must get their chief support out of traffic which the existing roads are entirely able to carry. A very large mileage has been built in Iowa and Dakota and in the Southwest, but we think that a larger proportion than last year has been in country already pretty well supplied with railroads.

The year closes with traffic in a very promising condition. The trunk lines and their connections with the West are making, there is reason to believe, the largest profits they have ever had, or very nearly so, though they have been doing so but two or three months. The Northwestern roads have a heavy traffic to carry, which is likely to be felt during the next few months more than at any time before. Unless there is some serious check to important industries by the reduction of new construction of different kinds, or a shock to some important industries resulting from their over-expansion, the prospect is fair that the railroads will make exceptionally good returns for the next half-year; the next harvest will largely determine their prosperity during the other half of 1883. There is one very encouraging feature in the situation, and that is the rapid settlement of the new lands in the Northwest recently made accessible by railroads. A continuance of this settlement and even an increase may be expected to follow the prosperity which the last harvest brought, and two or three years of such growth will immensely improve the position of some of the principal Northwestern railroads and be of great advantage to all the lines further east.

Under the head of "Traffic and Traffic Prospects" the reader will find the data which have led to some of the conclusions here stated, and which show what the traffic situation is and what it may be expected to be for some time to come.

TRAFFIC AND TRAFFIC PROSPECTS.

In discussing the business of the past year in another article, we have had to refer to certain facts regarding production and traffic which we could not always quote there without unduly extending the article.

The actual condition of traffic during the past year and the prospects for the next one, or the next half-year, at least, may be judged best by some traffic statistics which are subjoined. We should say, however, that as a considerably smaller proportion of the population is engaged in agriculture now than a few years ago, the agricultural traffic does not so well show the general condition of traffic as it used to, though, for reasons elsewhere given, it still shows very well what we are coming to.

The total production of cereals has been reported as follows for four years by the Department of Agriculture, in bushels:

1879.	1880.	1881.	1882.
2,686,000,000	2,703,000,000	2,013,500,000	2,685,000,000

The production this year is thus about the same as in 1879 and 1880, and 3.4 per cent. more than last year.

The population of the United States, allowing for immigration and a natural increase of about 2 per cent. a year, which will just about account for the increase from 1870 to 1880, has been, at the end of June:

1879.	1880.	1881.	1882.
48,700,000	50,150,000	51,900,000	53,700,000

That is, there has been an increase of about 5,000,000 since 1879, which, by the way, will cause the country to consume about 25,000,000 more bushels of wheat than then, and other things in proportion; and makes the production of cereals, which was 55 bushels per head in 1879, only 50 bushels in 1882, and reduces the surplus for exportation much more in proportion.

The grain and flour movement for the year to Dec. 16 has been, flour reduced to wheat, in bushels:

1879.	1880.	1881.	1882.
N. W. receipts...278,444,000	316,743,950	275,604,012	249,943,610
N. W. shipments...225,214,048	258,198,598	233,734,568	200,913,156
Atlantic receipts...328,931,197	345,555,524	278,583,930	309,402,828

There was so great a change made by the good harvest, that we will do well to examine the movement then, as indicating better the actual condition of grain traffic. Receipts of flour and grain at the eight re-

porting Northwestern markets from Aug. 1 to Dec. 16 have been, in bushels:

1879.	1880.	1881.	1882.
133,906,327	157,674,356	121,701,507	128,111,627

Thus though these receipts were 5 per cent. larger this year than last, they were 18 $\frac{1}{2}$ per cent. less than in 1880 and 4 $\frac{1}{2}$ per cent. less than in 1879. This falling off was due to lack of corn, the shipments of which until very recently have been from the bad crop of 1881. About 29,000,000 bushels less corn has been received this year since July than last year, 30,000,000 less than in 1880, and 11,000,000 less than in 1879.

The receipts at Atlantic ports since August have been:

1879.	1880.	1881.	1882.
122,304,163	120,898,408	82,468,540	90,845,063

This year there is an increase of 10 per cent. over last, but there is still a decrease of 25 per cent. from 1880 and of 26 per cent. from 1879. This, too, is chiefly due to a smaller corn movement. While the total receipts since August this year were 8,400,000 bushels more than last year, the corn receipts were 16,700,000 less; of the decrease of 30,000,000 bushels since 1880, 25,800,000 was corn; and of the decrease of 31,500,000 since 1879, 16,600,000 was corn.

There was a declining movement in the production of fat hogs and the provisions made out of them, caused chiefly, doubtless, by the great falling off in the corn crop of 1881 (1,195,000,000 bushels, against 1,717,000,000 in 1880).

The number of hogs packed in the Northwest during the "winter season" (four months November to February, inclusive) and the "summer packing season" (eight months March to November, inclusive) have been for five years:

1877-78.	1878-79.	1879-80.	1880-81.	1881-82.
Winter...6,505,476	7,480,048	6,950,451	6,919,456	5,747,700
Summer...3,378,044	4,051,248	5,323,898	4,803,980	3,224,872
Year...9,883,520	11,531,296	12,274,349	11,723,435	8,972,602

The number last year was thus much smaller than in any other of the five; it was, however, larger than 1876-77 or any earlier year. The decrease from 1880-81 is no less than 2,750,543, or 23 $\frac{1}{2}$ per cent., due chiefly, doubtless, to the short corn crop. It would seem impossible to replenish the stock of hogs very soon, and the packing this year indicates that nothing is yet done towards it, but from 1876-77 to 1877-78 there was an increase of 2,239,090 in the number packed, equal to 29 per cent. We cannot hope to see any increase now until the next summer packing season, as the returns for the first six weeks of the present "season" indicate.

For these six weeks, so far reported, from Nov. 1 to Dec. 13, the number packed is given as follows for five years:

1878.	1879.	1880.	1881.	1882.
3,593,857	3,819,149	4,006,739	2,900,103	2,421,457

We suspect then in the last two years the packing of some places is omitted which is given in the totals for the earlier years, but this would not make a difference of more than 200,000 or 300,000, so that without any doubt the number packed this year is a sixth less than last year and at least a third less than in 1880.

Iron ore shipments from Lake Superior have been for six years, in tons:

1877.	1878.	1879.	1880.	1881.	1882.
965,057	1,101,306	1,303,679	1,850,625	2,225,087	2,510,511

There has been no interruption to the growth of this traffic, and the increase last year was greater than ever before, as the production of iron in the country was doubtless also much greater than ever before.

The lumber production of the Northwest, the figures for which we cannot give now, was materially larger in 1882 than in 1881, when it was much larger than in any previous year. There is now, however, an unusually large stock on hand, and prices are so weak that it is quite probable that there has been some over-production. The preparations for getting out logs in the winter for next season's production are on such a scale as to make it probable that there will be enough for a production greater than this year even.

The production of anthracite coal for the eleven months of the year ending with November, has been, in tons, for the past five years:

1878.	1879.	1880.	1881.	1882.
16,152,525	24,469,939	21,924,500	26,100,763	26,079,825

The production this year was thus a little greater than last year, when it was much larger than ever before. It is desirable to know the recent course of this important traffic, since the good harvests have had their effect on business, and the slackening of the demand from new railroads have reduced the requirements of some of the rail mills (most of which do not use anthracite, however). In the four months from August to November, inclusive, the anthracite shipments have been:

1878.	1879.	1880.	1881.	1882.
6,634,988	10,570,277	10,415,380	11,784,324	11,661,919

The production in this latter period makes nearly as favorable a showing as for the eleven months.

Petroleum exports for five successive years from Jan. 1 to Dec. 16 have been, in gallons:

1877.	1879.	1880.	1881.	1882.
329,134,901	402,770,289	331,107,743	490,323,894	485,506,448

The exports this year have been about 1 per cent. less than in 1881, but 47 per cent. more than in 1880.

The production of cotton (estimated by the Department of Agriculture for 1882) has been, in pounds:

1879.	1880.	1881.	1882.
2,772,448,480	3,201,510,730	2,535,030,378	3,082,000,000

The increase this year over last is nearly 19 per cent., but the crop is estimated to be $\frac{3}{4}$ per cent. less than that of 1880. Per head of population the production was 57 lbs. in 1879, 62 in 1880, 50 in 1881, and 57 $\frac{1}{2}$ in 1882.

The receipts of this year's cotton crop at the seaboard have been from Sept. 1 to Dec. 22, in bales:

1877.	1879.	1880.	1881.	1882.
2,332,915	2,576,136	3,012,549	3,257,664	3,032,489

The receipts this year were, therefore, $\frac{2}{3}$ per cent. more than last year, and only $\frac{1}{4}$ per cent. less than in 1880, when they were larger than ever before.

The exports this year have been 1,016,546 bales, against 1,406,100 last year, an increase of 510,446 bales, or 36 per cent.

These statistics, we think, will help materially in forming a sound judgment of the economic condition of the country and its immediate prospects. We repeat the caution, however, that a so much larger proportion of the population is employed in manufacturing industries and in building now than a few years ago that the agricultural statistics do not so well represent the general condition of business in the country. With the same production we have less to export, which is not a misfortune if the men employed in the new industries are producing economically what the country requires.

THE TREATMENT AND USE OF STEEL.

At a recent meeting of the British Association Sir William G. Armstrong read a paper on "The Treatment of Steel for the Construction of Ordnance and other Purposes,"* which contains much information of value and many suggestions regarding the limitations within which, with our present knowledge, the use of steel should be confined. The investigations, which were made by the author, the results of which are reported by him, were on the welding, tempering, drawing and annealing of steel. The investigations were made to throw some light on the adaptability of steel for gun-making, but, as the author points out, the results have a general interest independently of that use.

To some readers the process employed in the manufacture of ordnance in the works of Sir Wm. Armstrong & Co. should perhaps be briefly explained. The process referred to is what is called the "coil system." In the manufacture of cannon on this system a long bar of rectangular section and suitable size is first heated in a furnace of equal length to the bar, and when heated it is then wound, on a cylindrical mandrel of the proper size, into a coil similar to an ordinary spiral spring. The whole coil is then heated in a furnace to a welding heat, and placed on its end under an immense steam hammer, the blows of which weld together the edges of the bar which forms the coil. This coil when cooled is bored and turned to the proper dimensions and is shrunk over a hollow cylinder of forged iron, having the fibre running lengthways so as to resist the longitudinal strain.

The manufacture of such coils is a very severe test of the adaptation of steel for welding, and will indicate to what extent that material can be used for other constructive purposes when welding is necessary. That guns would be much stronger if these coils were made of steel instead of iron has frequently been maintained, and that steel which is very low in carbon can be welded is also very well known. To put the matter to a particular test, the author of the paper referred to procured a sample of mild steel, containing only about one-tenth per cent. of carbon, for the purpose. The elastic limit, or point at which permanent stretch commenced, was 13.5 tons per square inch, and its ultimate strength was 23.3 tons—both similar to the same qualities in iron. The ductility of the steel, though, was so great that it stretched 37.5 per cent. of length in 2 in. before breaking. When tempered in oil, however, the elastic limit of the steel was raised to 24 tons per square inch, and its ultimate strength to 28.6 tons, while its ductility remained nearly the same. As the distinguished author of the paper remarks, "the material was of very fine quality, and if the results attained with the tempered specimen could have been realized in a welded coil its superiority over wrought iron would have been very marked indeed." Two coils were made of this steel, both tempered in oil, and another was made

of wrought iron, and the latter and one of the steel coils were applied as a jacket to a steel cylinder closed at both ends and used for the purpose of determining the pressure exerted by different charges of gunpowder fired in confinement. On testing them it was found that the cylinder jacketed with the steel coil began to stretch laterally under a pressure which produced no change in the wrought-iron coil. To determine the cause of the inferiority of the steel two test pieces were cut from the steel coil which was not used, one of them being in the lengthwise direction of the bar and the other crosswise. The elastic limit of the first was 12.5 tons and of the second 12 tons instead of 24 tons. The ultimate strength of the two pieces was 19.1 and 20.1 instead of 23.6 tons and the elongation was 7.5 and 6 per cent. instead of 36. Another test piece was then taken and hammered out from a 2 x 5 in. section to 1 in. square, which on being tested showed a complete restoration of the fine qualities of the steel. The limit of elasticity rose to 21 tons, the breaking point to 27 tons and the elongation to 36.5 per cent. Tempering did not increase the strength of this piece. It should be remarked, too, that the test piece cut crosswise of the bar broke in the solid and not in the weld, showing that the latter was perfect. To determine whether the reduction in strength was due to overheating a pile was made and welded at a somewhat lower temperature than was employed in welding the coil, and test pieces cut crosswise to the bar were made and tested. These pieces all broke in the weld, showing that sound welds could not be made with lower heats.

At this stage of the experiments the question presented itself, whether it was the heating or the hammering which had injured the welded coil. The method of determining this was described as follows by the author of this paper:

"A piece of the material was cut from the coil and restored to a good condition by drawing under the hammer, and then heated up to the welding point and allowed to cool without being hammered for welding. In this case the fracture showed no change of crystalline structure, nor was there any decided alteration in quality, except that the hardening effect of the hammering was removed. It began to stretch at a low limit, viz., 12.5 tons per square inch, but its breaking point was 25.2, which was higher than in the original bar. The elongation remained nearly the same, being 34 per cent., so that the mere heating to a welding temperature without disturbing the particles by hammering had no serious detrimental effect. I then took a piece of the steel in the restored condition, and after heating it to the welding point, delivered upon it in that state a single blow of a hammer sufficient to crush it into half its thickness. The result was that the flattened pieces divided into fissures all around the edges. For the purpose of comparison I took a piece of wrought iron selected at random from a scrap heap, and treated it in exactly the same manner. The result was that the iron bore the blow, flattening it to the same extent as the steel, without showing the slightest fissure on the edges. These two pieces are now on the table, and it is impossible to examine them without perceiving that the steel, though differing so little from iron in the amount of its carbonization, was yet, when heated to the welding point, in a state of friability, while the iron remained perfectly plastic. The conclusion was thus confirmed that it is the disturbance of the particles in this friable state, and not the mere heating, which exercises the injurious effect in the welding process."

Further on in the paper it is said that "the friability of the steel at a welding temperature became more marked as the percentage of carbon was increased." One specimen with 41 per cent. of carbon "suffered very little from being merely heated to the welding temperature, provided that while so heated it was not disturbed by hammering, but it was so friable at that temperature that it broke into a mass of small crumbs under a moderate blow of the hammer."

Perhaps this curious fact, which has been elucidated in the paper quoted from, will be more distinctly apprehended if it is kept in mind that friability means easily crumbled, or "crumbly," to use a homely and expressive word not found in the dictionary. Being put into this condition apparently does not injure steel, provided it is not then crumbled by hammering.

The experiments which are described in a small pocket book issued by Messrs. Miller, Metcalf & Parkin, of Pittsburgh, indicate that if steel is heated so as to assume this friable condition, and is then disturbed by sudden cooling, the effect on it is analogous to that produced by hammering when in the same condition. The experiments referred to consisted of nicking a steel bar at intervals of a half to three-quarters of an inch, and then heating one end of the nicked part of the bar to a white heat, and so that the last section is not quite red hot. The bar is then quenched in cold water. On breaking the bar at the nicks the fracture at the part which was hottest will have a coarse, lustrous grain, and will be as brittle as glass. The grain of each section will grow finer and the bar stronger in proportion as it was cooler at the point of fracture when cooled. The original structure of any of the pieces may be restored by heating it "to a good red heat, not to a high red, and allowing it to stay at this temperature for ten to thirty minutes." In this case apparently it is not the high temperature which does the injury, but the dis-

turbance due to the sudden cooling when in this crumbly condition.

We are all familiar with the analogous effect of cold on certain substances, and most of us in our early study of the physical qualities of molasses candy have observed that it becomes friable at low temperatures but suffers no injury when in that state unless disturbed by a blow, and that without such disturbance it may be made to assume a plastic condition by warming, and can be brought from one condition to the other repeatedly, without any apparent permanent alteration of its molecular condition, by simply changing its temperature. This does not surprise us, and it is only because the effect of high temperature ordinarily is the reverse that we are surprised that steel should assume a friable condition when it is hot enough to weld. Cast iron acts in a similar way, and the phenomenon seems to be due simply to the presence of carbon.

With reference to a remedy, Sir Wm. Armstrong says that so far his experience casts no light on the question whether this friability at a high temperature can be corrected by combining other materials with the steel, and he says further that if it can be so corrected without detriment to the material, the knowledge how to do it will be an important acquisition to metallurgical science. Until such knowledge is within our reach, the fact which he has pointed out has an important bearing on the use of steel for all structural purposes which require that it should be welded. If, as he points out, steel cannot be welded without permanent injury to the material which is worked when at a welding heat, it is a very serious objection to the substitution of that material for wrought iron where welding is necessary in the process of manufacture.

There are, though, some other very curious facts pointed out in the paper of which such liberal use has been made in this article. These are the great increase in the elastic limit, the ultimate strength and the ductility due to hammering, rolling and wire-drawing at comparatively low temperatures. Without detailing the interesting experiments which he made to show this, it must be sufficient here to point out that specimens cut from a block of gun steel were very much improved in all the qualities named simply by being drawn out under a hammer at a red heat, and also by being tempered in oil. This increase was cumulative, too, as a piece, after being hammered, was not only improved by hammering, but there was a further addition to its strength by tempering afterwards. An attempt was made to weld some slabs of steel with 0.34 per cent. of carbon, but it was found impossible to make sound joints. A piece of this material, "spoiled in the attempt to weld it, having been drawn out into a bar of an inch square, proved to be far stronger than in the original state."

Unhammered steel castings are also said to be much improved by tempering in oil, and it is recommended that both castings and steel that has been either rolled or forged should be tempered. The saving of the weight of material necessary for a given purpose, it is claimed, would amply repay the cost of tempering.

The fact that annealing steel plates after being punched or flanged will neutralize the injurious effects of these processes has often been pointed out.

We have then a curious collection of facts relating to steel. It seems that if it is either hammered or suddenly cooled at a welding temperature, its strength is thereby materially diminished. Next, that this strength can be restored by rehammering at a comparatively low temperature or reheating and allowing the material to cool slowly. Further, if the strength is diminished by severe strains while cold, steel recovers most or all of the good qualities which were lost in this way simply by annealing. It seems as though the doctrine of Hahnemann, *similia similibus curantur*, applied to this material. That is, the same treatment which injures its quality, if gently applied restores it. It will be seen too that the disturbances either of hammering or sudden cooling, when at a welding heat, have a similar effect on the quality of the material, and that rehammering at a low heat restores the strength which is lost by hammering at a high temperature, and that reheating and slow cooling will bring back those qualities which were lost by sudden cooling from a welding heat. Now it is practically impossible to rehammer many of the parts of machinery or other structures which must be made by welding. It would, however, be entirely practicable to anneal articles made in this way. If slow cooling will restore the qualities which were lost by quick cooling, it seems probable that it would have a similar effect on steel which has been injured by hammering at a welding heat. On this question the experiments of Sir Wm. Armstrong shed no light. The experimental steel coils which he manufactured

*See Engineering of Aug. 12, 1882.

he says had no appearance of defect in the welding in either case. They were both tempered in oil, and he says:

"I was not surprised to find that the coil itself had derived no benefit from the tempering, because although steel, so low in carbon as this sample, is considerably improved by tempering when the piece subjected to the process is of small dimensions, yet when the bulk is considerable the cooling in the oil is not sufficiently rapid to produce any decided effect."

Annealing a large mass would not be attended with the same difficulty, and could be thoroughly done. It would be very interesting to know what its effect would be if a process similar to that used in this country for annealing cast-iron car-wheels had been employed with one of those coils or on any other sample of steel which had been hammered at a welding heat. At any rate the fact that steel crumbles if hammered at a welding heat, and that the more carbon it has the more it crumbles, though not unknown before, has never been so clearly presented before as in the paper referred to, and should be kept in mind wherever steel is manufactured by welding.

THE WESTERN VANDERBILT ROADS.

On Friday of last week were held meetings of the boards of directors of the Lake Shore & Michigan Southern, the Michigan Central and the Canada Southern railroad companies, at which were presented statements of earnings, expenses, fixed charges and surplus available for dividends of these roads, for the year 1882. These statements, in connection with the statements for the first half of the year made at the end of June, and with the report of the New York Central Company, which this year was made the same day, have great interest, especially in years when there has been a great change in the amount of traffic or the rates on it. For instance, last year we got our first accurate knowledge of the effect of the railroad war from these reports. The New York Central report, published a few days earlier, had only the first three months of the war rates on east-bound freight, only two months of those on west-bound freight, and only a month of the lowest through passenger rates in both directions, and moreover, as it gave no report for the first six months of the year, we could find in the report only the effect of the few months of war rates on the business of twelve months. But the profits of the Western Vanderbilt roads for the half-year, compared with their profits in the first half of the year and in the last half of 1880, showed just what the railroad war was doing. We analyzed these reports quite minutely in our first issue of this year, and drew very important conclusions as to the strength and weakness of the several companies in that trying half-year.

This year we have had a revolution in traffic something like that of last year, but in the opposite direction. In the first half of 1881 there was a heavy traffic to carry, and it was carried at remunerative rates, but owing to exceptionally severe and long winter weather the expenses were unusually great. In the second half rates on through traffic were below cost, and the poorest crops on record gave less east-bound through traffic to be carried than for years before, though, as the trunk lines diverted much traffic from the lakes and the canals, the reduction of traffic was not much felt by them until the first half of this year. There was thus a marked change for the worse from the first half to the last half of the year, which is illustrated by the fact that Michigan Central, which earned \$4.63 per share in the last half of 1880 and \$2.36 in the first half of 1881, earned but thirty-six cents in the last half of 1881.

This year the east-bound traffic was carried for two months or more at war rates, and in enormous quantities, and when rates were restored afterwards there was little left to carry of the crops of 1881. Just about as much was carried from Chicago in January and February as in the four following months from March to June inclusive. The west-bound through freight was pretty much all contracted away at war rates until July. So in the first half of this year there was an exceptionally light through traffic in one direction, and low rates on most of the through freight. The Eastern roads all this time were profiting by the great activity in manufacturing enterprises, especially those which carried coal and iron. The Western roads profited less by this, and suffered more by the effect of bad crops on their local traffic, which was especially severe on the Michigan Central.

In the second half of the year we have another change. Rates were everywhere restored by the first of July (though bills for rebates had to be paid for some months longer); the wasteful expenditures in connection with through passenger traffic were probably less than ever before; then came good crops, which first began to have considerable effect on these roads not much before September, however;

while down to the close of this year they have suffered greatly by the failure of last year's corn crop. Traffic, until quite recently, has not become so heavy as before the railroad war, nor have freight rates been so high as before; but all traffic has been remunerative, and for the last three months most traffic, through and local, has been large, and the position and immediate prospect of the roads are in many respects the reverse of what they were a year ago.

In examining the reports below, we compare first the results of the last four half-years:

THE LAKE SHORE.

The gross and net earnings, expenses and surplus over fixed charges of this company for the four successive half-years have been:

	1881.		1882.	
	1st half.	2d half.	1st half.	2d half.
Gross earnings.....	\$8,854,926	\$9,016,465	\$8,026,200	\$10,248,800
Expenses.....	5,285,164	5,993,265	5,403,791	5,721,200
Net earnings.....	\$3,669,762	\$3,023,200	\$2,622,409	\$4,527,591
Fixed charges.....	1,362,000	1,363,375	1,500,000	1,490,000
Surplus.....	\$2,307,762	\$1,659,825	\$1,122,409	\$3,037,591
Per share.....	\$4.66	\$3.36	\$2.27	\$6.10

The change in the last half of this year is astonishing. The profits per share are at the rate of 1 per cent. a month, and are 2½ times the profits in the first half of the year. This great change is not indicated by the report made last week, except to those who have kept trace of the report for the first half of the year. Obviously in this case it is more important to know the condition of business in the last half of the year than for the whole year, as the former indicates the present condition of business and what it is likely to be through the rest of this crop year. This profit of \$6.10 per share is larger than in any previous half-year; in 1880, when the profits for the whole year were \$11.28 a share; for the last half they were \$5.88.

The increase in profits over the corresponding half of 1881 was due to an increase of \$1,232,335 in gross earnings and a decrease of \$272,056 in working expenses. From the consequent gain of \$1,504,391 in net earnings \$126,625 is absorbed by an increase in fixed charges, leaving all the rest available for dividends.

The gross and net earnings, working expenses and profits per share of stock of this company in the last half of the year have been as follows, for the last six years:

	Gross earnings.	Expenses.	Net earnings.	Profit per share.
1877.....	\$7,045,968	\$4,335,847	\$2,708,140	\$2.66
1878.....	7,393,674	4,317,027	3,066,647	3.46
1879.....	8,333,010	4,716,003	3,616,407	4.58
1880.....	9,676,461	5,398,721	4,277,740	5.88
1881.....	9,016,455	5,993,265	3,023,200	3.36
1882.....	10,248,800	5,721,200	4,527,591	6.10

The gross earnings as well as the net earnings and profits were decidedly larger this year than ever before. The working expenses, though 4½ per cent. smaller than last year, still were larger than in any other year.

Altogether this is an extremely favorable statement.

THE MICHIGAN CENTRAL.

Here again the official statement for the year fails to show the improvement in business since June, until we compare it with the figures in the statement for the first half of the year. Below we give the figures the last four half-years:

	1881.		1882.	
	First half.	Last half.	First half.	Last half.
Gross earnings.....	\$4,340,000	\$4,564,332	\$4,177,500	\$4,772,500
Expenses.....	3,045,000	3,087,066	3,250,000	3,275,000
Net earnings.....	\$1,295,000	\$1,477,266	\$927,500	\$1,497,500
Fixed charges.....	863,000	839,926	900,000	900,000
Surplus.....	\$442,000	\$637,340	\$27,500	\$597,500
Per share.....	\$2.36	\$3.65	15 cts.	\$3.18

The official statement that the profits of the year were at the rate of \$3.33 per share does not seem a very favorable one; it puts altogether a different phase on the matter when we learn what a comparison with the first half of the year shows, that no less than \$3.18 of this \$3.33 was earned in the last half of this year; in view of the late harvest in Michigan it is probable that fully two-thirds of the half-year's profits were made in the last quarter of the year.

The gross and net earnings, working expenses and profits per share of this company in the last half of the year have been as follows for the last five years:

	Gross earnings.	Expenses.	Net earnings.	Profit per share.
1878.....	\$3,662,023	\$2,071,487	\$1,570,536	\$4.07
1879.....	4,005,704	2,464,592	1,541,202	3.99
1880.....	4,464,749	2,817,751	1,646,998	4.63
1881.....	4,564,332	3,087,066	1,477,266	3.65
1882.....	4,772,500	3,275,000	1,497,500	3.18

This road, like the Lake Shore, had larger gross earnings this year than in any corresponding half-year previous, but the increase over last year is but small, and the increase in net earnings and profits is chiefly due to a reduction of \$412,000 in working expenses. These, however, were larger than in any other half-year except last year.

THE CANADA SOUTHERN.

We have here the report of the last year that this

line is to be worked as an independent road, as after this year the Michigan Central will work it, and probably there will be no separate statement of their earnings and expenses. This has been the weakest of the Vanderbilt roads, but with through rates maintained it was able to make very respectable profits with the traffic it has had hitherto. When it gets substantially the whole of the Michigan Central's through traffic, of course it will do much better. Its earnings and expenses were not reported for the first half of this year; but in the last half of last year the net earnings were \$127,851 less than the interest on the bonds, and there was a loss of 85 cents per share of stock. (For the whole year, however, the net earnings covered the fixed charges and left a profit of 19 cents a share.) Now, this company must have been affected by the same causes which made the profits of the Lake Shore so much less in the first half of this year than in the last half of last year—rather more than it, we should say, because a much larger proportion of its traffic is through. Now, the net earnings of the Lake Shore were 13 per cent. less in the first half of this year than in the last half of 1881, the Michigan Central's, through a great decrease in working expenses, were about the same in both halves. It is probable that the Canada Southern had a decrease at least as large in proportion as the Lake Shore. But counting it as only 10 per cent. would make its net earnings in the first half of this year only \$191,000, which is \$149,000 less than the interest on the bonds for the time, which is a loss of about a dollar (just 99½ cents) per share of stock. On this supposition, the profits of the company, though only \$1.52 cents per share for the whole of 1882, were \$2.51 for the last half of that year. And this change, great as it is, is not greater than was to be expected of a line like this, whose traffic is almost wholly through. Thousands of tons of flour were carried over the line of which it forms a part last January at the rate of eight cents per 100 lbs. from Chicago to New York, and out of this, we suppose, came the New York terminal charge of 3 cents per 100. The Canada Southern's share, without deducting the terminal, was only about 2 cents per 100 lbs., and even with its exceptionally heavy train loads, this would give but \$55 for hauling its average train load from Detroit to Buffalo, more than 250 miles, or 22 cents per train-mile. Now in 1881, the average expense per train mile on this road was 97 cents, including passenger trains, which are not nearly so expensive as heavy freight trains. Of course the very low rates were exceptional. If they had not been the road would not have earned a quarter of its working expenses. But it is doubtful if the average rate received on east-bound freight January last, when traffic was heaviest, was more than 10 cents per 100 from Chicago to New York, and in February, when also it was very heavy, one-third more; and as throughout the first half of the year west-bound freight also was carried at less than half the regular rates, it is difficult to see how this road, whose local freight traffic last year was not 8 per cent. of its total freight traffic, and whose east-bound through traffic after rates were restored was the lightest for years, and whose passenger traffic was not heavy, could have failed to incur great losses then. The figures for this loss which we have given are too small rather than too large, in all probability, so that the estimated profit of \$2.51 per share in the last half of the year seems entirely reasonable. This was not a half-year of heavy east-bound traffic until near its close, and rates were lower than usual when agreed upon; but there was a profit on all traffic, and in some branches a decidedly heavy traffic. It should be said, however, that the last half of the year is usually more productive than the first half, and that, if it had only the same traffic as heretofore, we could not expect the Canada Southern to earn a profit of \$2.51 per share in the first half of next year. But its amalgamation with the Michigan Central must certainly bring it an immense increase of traffic, which should be carried without a corresponding increase in expenses. As, however, the profits of the two roads will go into one common fund, it may not get all the increase in profits which will be made on it, probably will not, and certainly should not, as the Michigan Central, which gives the additional traffic and takes all the risks of a loss of traffic from the other Canada roads, is entitled to share in the profits secured by the amalgamation.

As the Canada Southern made no statement of earnings and expenses in the first half of the year, we cannot compare them for the last four half-years, as we have done for the other roads. We will, however, submit our estimates of net earnings, surplus and profit or loss per share for the two halves of this year with the reported figures for the two halves of

last year, premising that if the figures for one half of 1882 are too large, those for the other half must be too small by the same amount:

	1881		1882	
	First half.	Last half.	First half.	Last half.
Net earnings.....	\$485,143	\$211,309	\$190,000	\$716,733
Int. charge.....	338,464	339,160	339,313	339,312
Surplus.....	\$146,679	\$127,851	\$149,313	\$377,423
Deficit.....				
Per share.....	Profit, 98 cts.	Loss, 85 cts.	Loss 99 cts.	Profit, \$2.51

These may seem like tremendous fluctuations in profits; but any company whose traffic is nearly all through, and which receives at the rate of 40 cents per 100 lbs. from Chicago to New York one winter (as the trunk lines did in 1879-80), and an average of 12½ cents another winter (as the same lines in 1881-82, probably), with occasional shipments at 8 cents, must suffer great fluctuations in profits. That they are more evident on the Canada Southern than on the other two roads is simply due to the fact that its traffic is nearly all through. While they were carrying through traffic at a loss, they were also carrying an enormous local traffic at a profit. The Canada Southern has had no such resource.

It will have hereafter, however, because it will have a share in the profits from the local as well as the through traffic of the Michigan Central.

Not being able to give the earnings and expenses of the Canada Southern for the last half of its fiscal year we give them below for the whole year, for the last five years:

Year.	Gross earnings.	Expenses.	Net earnings.	Fixed charges.	Surplus.	Profit share.
1878.....	\$2,480,873	\$2,070,258	\$410,615	\$353,427	\$57,188	\$0.38
1879.....	2,985,395	2,448,090	547,305	391,452	155,853	1.04
1880.....	3,705,074	2,406,341	1,298,733	497,800	791,538	5.28
1881.....	3,269,260	2,672,347	596,913	678,425	\$27,945	0.19
1882.....	3,452,795	2,553,997	898,798	679,089	\$227,647	1.52

* Receipts of \$9,657 this year from other sources than net earnings.
† Receipts of \$7,938 this year from other sources than net earnings.

The large surplus in 1880 was partly due to the fact that the bonds then drew but 3 per cent. interest. The advance to 5 per cent. since has been nearly equivalent to 2 per cent. on the stock.

But as is the case with the other companies, the results for the year do not enable us to judge of the present condition of business, which the results for the last half-year do. This company, however, and the Michigan Central will have a special addition to their earnings hereafter by their union, which, so far as can be judged beforehand, is likely to benefit both largely, the larger part of the additional profit, perhaps, going to the Michigan Central, but the larger profit per share to the Canada Southern, which has a smaller share capital. Their relative shares, however, will vary much with the relative amount of local and through traffic and the rates on each.

The great change from the first half to the second half of the year shown by these three Vanderbilt roads may be compared with the change on the Pennsylvania, whose figures, however, we have not for the whole of the last half-year, but only for five months of it as yet. But while this great road showed an increase of 5 per cent. in gross and a decrease of 9 per cent. in net earnings in the first half of the year, in the four months following there was an increase of 18 per cent. in gross and of 25½ per cent. in net earnings. As its earnings are more largely from local traffic than those of the Western Vanderbilt roads, and were extraordinarily large from coal and iron traffic in the first half of the year, the gain of \$1,843,000, which it made in the five months after June, must largely be due, we should say, to the restoration of rates on through traffic; and the gain from this cause should be much larger in proportion to their total traffic on the Vanderbilt roads west of Buffalo. The Pennsylvania's report, then, tends to confirm the statements made by the Vanderbilt companies.

In closing we call attention to the great value of half-yearly reports. A report for an entire year often, as in the case of these roads, is almost valueless as a guide to the present condition and course of business. A year ago the profits of the calendar year were at a rate very much greater than the roads were realizing at the end of the year when their reports were rendered; for this year, entirely the reverse is true. For these roads we are able to give a statement for both halves of the year, and this alone makes it possible to judge what their condition now is. The reports of these roads, however, would be more valuable if with the report for the year was given a corrected statement for the first half of the year. The latter necessarily is partly estimated, being made a week or ten days before the half-year closes. But made as they are, the reports give most valuable information.

November Earnings and Expenses of the Pennsylvania Railroad.

The Pennsylvania Railroad Company reports that in November last the gross earnings of its lines east of Pitts-

burgh and Erie were \$583,610 (12½ per cent.) more than last year, its working expenses \$391,592 (16½ per cent.) more, and its net earnings \$142,018 (8½ per cent. more.)

The earnings and expenses in November for ten successive years have been:

Year.	Gross earnings.	Expenses.	Net earnings.
1873.....	\$3,015,370	\$1,823,449	\$1,191,927
1874.....	3,004,913	1,728,843	1,276,070
1875.....	3,047,776	1,736,005	1,311,771
1876.....	3,465,231	1,654,393	1,810,838
1877.....	3,059,457	1,593,373	1,466,084
1878.....	2,996,102	1,001,852	1,994,250
1879.....	3,31,997	1,785,519	1,530,478
1880.....	3,574,911	2,183,838	1,391,073
1881.....	3,840,116	2,379,872	1,460,244
1882.....	4,373,826	2,771,464	1,602,362

The gross earnings, we have seen, were this year 12½ per cent. more than last, but last year they were larger than ever before in November, in spite of the railroad war, and the earnings this year are 22½ per cent. more than in 1880, 40 per cent. more than in 1879, and 46 per cent. more than in 1878.

The gross earnings, however, last November were about \$286,000 less than in October and less also than in September and August, but larger than in any other month in the history of the company.

The working expenses have increased much more in proportion than the earnings. They are not only larger than in any other November, but larger than in any other month of any year, though not much larger than in the other months of this year since July. Nearly three-fourths of the increase in earnings over last year was absorbed by the increase in expenses.

The net earnings, however, are larger than in any other November, except 1876. But they are \$485,000 less than in October, and less than in any other month since June. There were, however, but three months last year when the net earnings were so great.

The gains on this Eastern system of the Pennsylvania Railroad Company, however, are entirely eclipsed by those of its lines west of Pittsburgh and Erie in November. Their surplus over liabilities—which measures the profit to the Pennsylvania Railroad Company from them—was \$922,347 this year, against \$337,789 last year, and \$943,281 during the other ten months of the year. This is easy to understand, because these Western lines are largely supported by farm products, and there was little for them to carry last year, and at the same time the rates obtained on a large part of their traffic was only about half as great as this year. But this gain makes the profits of the company from its two systems \$2,531,709 this year against \$1,798,133 last year—an increase of \$726,576, or enough for a dividend of 87 cents a share on the company's stock—all in one month.

For the eleven months ending with November the earnings and expenses of the lines east of Pittsburgh and Erie have been for seven successive years:

Year.	Gross earnings.	Expenses.	Net earnings.
1876.....	\$33,808,404	\$20,370,819	\$13,437,585
1877.....	28,275,753	17,386,675	10,889,078
1878.....	29,031,439	16,795,629	12,235,810
1879.....	31,166,353	18,440,865	12,725,488
1880.....	37,712,241	22,203,468	15,508,773
1881.....	40,392,428	24,181,246	16,211,182
1882.....	44,822,661	27,675,084	17,147,577

Compared with last year there is an increase of \$4,530,233 (11½ per cent.) in gross earnings, of \$3,493,838 (14½ per cent.) in working expenses, and of \$1,036,395 (6 per cent.) in net earnings, though last year these were all larger than ever before. Since 1880, which for most railroads was probably the best season they have ever had, there is an increase of \$7,200,000 (19 per cent.) in gross and of \$1,740,000 (11 per cent.) in net earnings. The expenses, which were 59 per cent. of the earnings in 1880 and nearly 60 per cent. in 1881, were 61½ per cent. this year, indicating a higher cost per unit of traffic or a lower average rate, and probably both.

The surplus over liabilities of the lines west of Pittsburgh and Erie for the eleven months ending with November was \$1,865,623, against \$2,740,008 last year, a decrease of \$874,385. At the end of June there had been a loss on these lines of \$120,707, against a profit of \$1,573,303 in the corresponding half of 1881. There has been, therefore, during the five months ending with November a profit of \$1,936,335 from these lines, while in the corresponding five months of last year the profit on them was but \$1,166,705. There must be a large increase over these profits this December, so that we are reasonably sure of a substantial increase in the profits of the year.

It is worth noticing (because these lines indicate pretty well the course of traffic of the other railroads west of Pennsylvania) that the lines west of Pittsburgh and Erie are doing better now, or did better in November, than at any other period in their history. Their surplus over liabilities last November was \$922,347. In no previous month has it been so much as \$800,000, and the largest heretofore have been \$525,000 in March 1880, \$593,000 in October and \$541,000 in December, 1879. It should be said, however, that the margin of profit on these lines is quite narrow. These lines earned gross about \$37,000,000 and net \$12,350,000 last year, and then the profit was \$2,500,000, or about one-fifth of their net earnings; in many months there have been losses on this system, once as much as \$250,000. As the liabilities are for the most part fixed, when net earnings are large the surplus over liabilities may be very large, and vice versa.

As the reports of the Vanderbilt roads west of Buffalo show that their profits were immensely greater in the last half than in the first half of the year, it will be interesting to learn what the results have been on the Pennsylvania Railroad since June. We have not the figures for the half-year yet, but only for five months of it. They compare as

follows with the corresponding five months (July to November, inclusive) last year.

	1882.	1881.	Increase.	P. c.
Gross earnings.....	\$22,271,808	\$18,838,589	\$3,433,219	18.2
Expenses.....	13,214,150	11,624,561	1,589,589	13.7
Net earnings.....	\$9,057,658	\$7,214,028	\$1,843,630	25.5

Down to the end of June the Pennsylvania lines east of Pittsburgh and Erie had a decrease in net earnings amounting to \$807,090 (9 per cent.), though these lines had the enormous coal and iron traffic to support them, which profited lines further north but little. In the same six months there was a decrease of \$1,645,521 in the profits of the lines west of Pittsburgh and Erie, which has been reduced by \$771,141 through the increase of their profits in the following five months, so that the profits of the Pennsylvania Railroad Company from these two systems during the five months ending with September were \$2,614,771 (22½ per cent.) more this year than last—equivalent to more than 3 per cent. on the stock. During the first half of the year there was a decrease of \$2,452,551 in the profits of the two systems. Thus, these lines show, like the Western Vanderbilt roads, that the last half of the year has been as favorable as the first half was unfavorable—that the present is a period of great prosperity for lines situated like these.

Record of New Railroad Construction.

This number of the Railroad Gazette contains information of the laying of track on new railroads as follows:

Chicago, Iowa & Dakota.—Track laid from Eldora Junction, Ia., west to Eldora, 5½ miles.

Connotton Valley.—The Straitsville Branch is extended from Justice, O., southwest to Coshocton, 26 miles. Gauge, 3 ft.

Georgia Pacific.—Extended from Tallapoosa, Ga., west into Alabama, 33 miles. Also to a point ten miles east of Anniston, Ala., an extension of 5 miles.

Kansas City, Springfield & Memphis.—Track laid from Nettleton, Ark., east by south to Jonesboro, 25 miles.

Wabash, St. Louis & Pacific.—The Des Moines Division is extended from Eads, Ia., northwest to Fonda, 28 miles.

This is a total of 122½ miles of new railroad, making 9,922 miles thus far this year, against 7,870 miles reported at the corresponding time in 1881, 6,139 miles in 1880, 3,801 miles in 1879, 2,263 miles in 1878, 2,919 miles in 1877, 2,278 miles in 1876, 1,333 miles in 1875, 1,844 miles in 1874, 3,630 miles in 1873, and 7,160 miles in 1872. This is not by any means the total track laid last year, as information yet to be received will considerably increase the figures.

THE EFFECT OF THE RESTORATION OF RATES AT ST. PAUL, after the four weeks of railroad war, so far as is shown by the receipts of flour and wheat at Chicago and Milwaukee, we endeavor to show below, by giving the receipts of the week one week before the war broke out, of each week during the war, and of the week after the war, as follows:

Before War:		Flour, bbls.		Wheat, bu.		Total flour and wheat bu.
Week to	Chicago.	Milwaukee.	Chicago.	Milwaukee.	Chicago.	Milwaukee.
Nov. 11.....	134,802	108,332	840,121	204,157	2,138,336	
During War:		Flour, bbls.		Wheat, bu.		Total flour and wheat bu.
Week to	Chicago.	Milwaukee.	Chicago.	Milwaukee.	Chicago.	Milwaukee.
Nov. 25.....	132,402	112,689	549,536	218,642	1,871,087	
Dec. 2.....	134,489	109,887	416,410	192,518	1,778,620	
Dec. 9.....	155,994	79,006	442,477	243,258	1,743,235	
Dec. 16.....	121,353	84,110	417,919	218,675	1,561,177	
Since War:		Flour, bbls.		Wheat, bu.		Total flour and wheat bu.
Week to	Chicago.	Milwaukee.	Chicago.	Milwaukee.	Chicago.	Milwaukee.
Dec. 23.....	121,246	74,847	372,551	264,007	1,418,976	

Thus in the week after the war, when rates from the competing shipping points in Minnesota, etc., were two or three times as high as during the war, there was a decrease in the aggregate receipts of wheat and flour at these two lake ports equivalent to 142,201 bushels; while the week before, without change in the low rates, there was a decrease of 182,058 bushels. For reasons heretofore given, the flour movement should show the effect of the war more accurately than the wheat movement. The week after the war the flour receipts were 196,093 barrels, which is 9,370 barrels (4½ per cent.) less than in the last week of the war. The flour receipts of the two places in each of the six weeks recorded have been:

Week to		Dec. 2.		Dec. 9.		Dec. 16.		Dec. 23.	
Nov. 11.	Nov. 25.	Nov. 25.	Dec. 2.	Dec. 9.	Dec. 16.	Dec. 23.	Dec. 30.	Jan. 6.	Jan. 13.
243,124	245,091	244,376	235,000	205,463	196,093	196,093	196,093	196,093	196,093

Though there is a decrease in receipts since rates were restored, we see that this is only the continuation of a movement which began when war rates prevailed; the latter seem to have had no effect in increasing receipts when the war began, and the advance in rates seems to have had very little effect in reducing receipts after it ended.

MINNEAPOLIS' LUMBER PRODUCTION is, next to its flour manufacture, the chief cause of its importance as a traffic centre. A great impulse has been given to the lumbering interest there and in West Wisconsin by the extraordinary influx of settlers into Western Minnesota, Dakota and Manitoba, which are wholly dependent on imported lumber, and find no considerable supply nearer than Minneapolis. The Minneapolis production for the past two seasons has been:

	1882.	1881.	Increase.	P. c.
Lumber, ft.....	296,372,092	233,545,071	62,827,021	26.9
Shingles, No.....	128,715,000	86,818,500	41,896,500	36.7
Lath, pieces.....	57,693,950	49,253,700	8,440,250	14.9

This production is about equal to one-seventh of the Chicago receipts, which come from more than a score of places where lumber is sawed.

It is the lumber traffic chiefly which gives return loads to the cars which come to St. Paul and Minneapolis loaded with wheat, but they do not depend upon the product of Minneapolis mills, by any means. These places receive and

distribute a considerable portion of the lumber manufactured in West Wisconsin, on the St. Croix and Chippewa rivers, and elsewhere, most of which reaches them by the St. Paul & Omaha Railroad. It was the revival of a great demand for lumber more than anything else, perhaps, which caused the astonishingly rapid improvement of this portion of this road, after the reorganization of the bankrupt West Wisconsin—another illustration that the choice of time for building a railroad may make all the difference between utter failure and brilliant success.

THE PRODUCTION OF LUMBER by the Saginaw Valley mills for four years, in thousands of feet has been:

1878.	1879.	1880.	1881.	1882.
574,162	736,106	878,356	982,320	1,012,915

The increase over last year was thus 29,595 thousand, or 3 per cent.

The production of all the mills on the Mississippi, extending from Brainerd, Minn., on the north to Hannibal, Mo., on the south, has been:

1878.	1879.	1880.	1881.	1882.
418,446	614,641	789,805	1,011,994	1,179,878

This year the production was 167,884 thousands (16½ per cent.) more than last year. The increase over 1878 has been 74 per cent. in the Saginaw Valley and 182 per cent. on the Mississippi.

The production of the mills below Minneapolis was 773,150 thousands this year, against 476,728 produced further north, and 304,312 thousands of this was sawed south of Minnesota, and 225,951 at the little group of towns near Clinton, Iowa—Sabula, Lyons, Clinton and Fulton. About Rock Island is another mill centre, Rock Island, Davenport and Moline producing 199,000 thousands.

IMMIGRATION IN NOVEMBER was less this year than last, as has been the case for some months past. The number arriving was 40,625 this year against 51,586 last year, a decrease of 21 per cent. For the five months of the fiscal year ending with November the arrivals have fallen from 291,320 in 1881 to 244,611 this year, a decrease of 46,709, or 16 per cent. The number, however, is very great this year, exceeded only in 1881.

NEW PUBLICATIONS.

Mention has heretofore been made in our columns of the literature of trade publications, and of what it is and might be of those who issue such books and pamphlets would practice the art of putting their knowledge into plain words and print. That there is a steady improvement in this class of publications is clearly shown by the specimens which are before us, of some of which it is proposed to write a brief notice.

The "railway edition" of the *Catalogue of Nathan & Dreyfus*, has pages 8¼ × 10¼ in., and is stitched in a handsome cream-colored glazed-paper cover, with the title printed on from a steel-plate engraving. There are 16 pages in the catalogue with descriptions of the different articles manufactured by this firm, the chief of which are injectors and oil-cups. The printing is of the very best and the engraving is very much better than the average work of this kind.

The first six pages are devoted to descriptions and illustrations of the different kinds of injectors manufactured by the firm, among which their "new patent lifting injector, with all the latest improvements," is included. There are directions for applying the various kinds of these instruments to locomotives, and also for working them, with lists and illustrations of duplicate parts and prices, and capacity of injectors. Then follows illustrations and descriptions of the ejectors, or water elevators, for raising water at water-stations and into locomotive tanks. There are also engravings and a slight description of injectors which are made for stationary, portable and marine boilers. After this two pages are devoted to the illustration and description of the oil cups which Messrs. Nathan & Dreyfus manufacture. Illustrations and descriptions of Watkey's improved valve-seats ends the circular.

It might be said of this, that it is excellent as trade catalogues go, but there is a great deal of information which it is quite certain Messrs. Nathan & Dreyfus could give which would increase immensely the value and interest of their publication, if that information were only presented in clear and concise language. A railroad man seeking information about injectors naturally looks to catalogues of this kind for it. As has been stated in these pages before, a catalogue of this kind ought, in a great measure, to be an elementary treatise on the article of which it treats. If it were, its usefulness to its readers, and we believe to its publishers, would be increased.

It is, perhaps, hardly fair to find fault with what the firm named have done because they have not done more. It is as though a person who is given beer should complain that it was not champagne. Speaking figuratively, it should be said that Messrs. Nathan & Dreyfus' beer is excellent (and, speaking literally, so is their champagne), but it is hoped that some day they will put in print some of the knowledge of which they have such an abundant store in reserve.

The *Westinghouse Machine Company's Illustrated Circular* is a pamphlet of 40 pages, 5½ × 7 in., elaborately illustrated with wood engravings of the very best kind, illustrating the Westinghouse engine in the most thorough and complete manner. This engine is a specialty of manufacture by the company named. The engravings were made by Ten Eyck and are fairly well printed by J. W. Pratt, both of New York. With a little better press work, the engraving would be as near perfection as it is possible to reach in that art. On pages 2 and 3 there front and rear prospective views of a 15 horse-power engine. In the first fig-

ure the engineer is represented in the back-ground reading a copy of the *Railroad Gazette*. On the fourth and fifth pages are vertical sections drawn longitudinally and transversely to the main shaft, the latter through the centre of the valve. On the sixth page is another transverse section through the cylinder. These engravings are on opposite pages with a sheet of tissue paper interleaved between them.

The descriptive matter begins with detailed references to the engravings, most of the parts in the sectional views being lettered. It may be said, too, that the letters in the text and in the engravings all correspond, and that there are no references to letters which cannot be found, as is so often the case with descriptions of this kind. Such omissions are often exceedingly exasperating to the reader. It would have made matters somewhat clearer though if in some cases there had been special reference to the figures, where letters are used. Thus, on page 8, "the bonnets h h" are referred to. The preceding description is of "Sketch 1," whereas h h only appear in figs. 4 and 5. Again reference is made to the eccentric K, which appears only in fig. 4; it is necessary therefore to hunt through the figures until it is found. These are, however, minor faults, but very common ones in descriptions of this kind.

The second section or chapter is a description of the "operation" of the engine, followed by another on the "principles of design." If the order of these chapters had been reversed, the construction of the engine would probably have been understood more easily, although, like the other, it is a minor fault.

In the chapter on the "Principles of Design," the objects aimed at in the design of the engine are described in detail.

There are besides this section on "Mechanical Construction," "Repairs," "the Peculiar Advantages and Peculiar Adaptations." Among the purposes for which this plan of engine is said to be adapted are electric lighting, circular saw-mills, rolling mills, grain elevators, wire mills, cotton-ginning, silk mills, flour mills, sugar refineries, fan, blowers, rotary or centrifugal pumps, direct connection to shafting, paper mills, print works, mining, light manufacturing, deficient water-power, portable power, steam yachts and tugs, and finally "to all purposes of power whatsoever when low first cost, economy, simplicity, durability and engineer's wages are an object." The list, with the last specification, is certainly comprehensive.

A price list and advertisement of the merits of Damascus bronze conclude the book or pamphlet, which shows all through it that it has been the work of some one who has that ability which distinguishes a superior designer of mechanism from the rest of mankind; that is, of being able to adapt mechanical means to ends in the most perfect way.

It is perhaps not to be expected that the persons who designed the remarkable engine described should put "parts of speech" together with as much skill as they have shown in adapting the different pieces of mechanism in the machines they build, but it is plain that the same ability which was exercised in the adaptation of appliances to principles, and vice versa, in the engine was also exercised in writing the illustrated circular. It is an elementary treatise in embryo and only requires that the principles and practice which are merely hinted at should be elaborated to make it just the kind of elementary treatise on the steam engine which is now much needed. This it is hoped the Westinghouse Machine Company will have done in the near future.

The Historical Development of the Organization of the Pennsylvania Railroad.

III.

We may further illustrate the relation of staff officers by the duties and influence in favor of economy of consumption of materials of the General Superintendent of Motive Power. This officer belongs to the General Manager's staff; under his supervision accumulated materials are properly distributed to the various shops, and through the shop accounts reported to him. He exercises an "economical influence" upon the use of construction materials, and materials used in the operation of the road. His formal relations are with the General Superintendents on the one hand and the General Manager upon the other; but in the practical working out of the organization his relations with subordinate officers of divisions and with the Purchasing Agent can become direct. In general, however, orders for materials are, we believe, made by the division superintendents.

The Purchasing Agent, however, consults the General Manager on all purchases for his department.

We shall not enter this time into the details of other departments, but shall attempt to give some statement of what we have termed the informal part of the organization.

No portion of the task undertaken is more difficult for an individual speaking from a study of facts and not from experience of any kind on the road. Nevertheless, we believe the following to be not misleading as to the essential spirit of the Pennsylvania Railroad Company's working methods.

To begin at the beginning, no organization can be established by printing a document, appointing officers, or by any other method than that of practical self-restraint on the part of those in power. Many attempted and beautiful schemes of organization fail because the head or heads controlling the same are too anxious for that peculiar self-consciousness of power which comes only through direct executive interference. In other words, a good organization, as a fact, supposes its organizer to be content to divide his authority, at least so far as appearances are concerned; moreover, while a strong organization may exist under an autocrat, it can have no power of self-development which shall continue to exist after his death. For these reasons and in view of a variety of facts, we give the credit of that policy

which has resulted in the Pennsylvania Railroad Company as now organized to its early officers. Always must we separate the intellect in all human affairs from those forces which are real and effective; and in this case we do not credit both to the same persons. It would be impossible to say, and we safely affirm that no one knows who created the Pennsylvania Railroad as a scheme of organization and a presentation of realized principles.

Like the British Constitution it has "grown" under the influence of many officers, but like the British Constitution, each item of principle has lived because there existed an indefinite but powerful set of examples or precedents copied as to spirit by officer from officer down to the present period.

In the first place, in the order of promotions, respect for the printed organization, resistance to outside influences which would place men in office on the ground of other considerations than those of trained and proved merit, and all those facts which make up the true company as an organized unity have come by a set of inherited official characters which exist in each department of the road because they have existed, and not because the road was organized upon a correct and beautiful plan.

The rule of custom as to promotions is that offices shall be filled by those trained in the company's service; and so essential a part is this rule of the informal organization that subordinate positions are created partly that it may not occur that the material for any position shall fail.

We find everywhere assistant officers in training for position; but as a fact, training merely will not give position aside from merit. We do not assert that the Pennsylvania Railroad is composed of perfect individuals; but we do thoroughly believe that merit and training are the most potent of all influences in giving positions of every kind upon the road. Each officer promoted and leaving a vacancy has more influence than any other one person, except the mind which determines the nomination to the Board, in filling his recent position. All nominations reach the Board through the President, and are formally given his approval before any action can be taken upon them.

If the principle of filling all offices by those already in the services of the company were made an inflexible rule, it, in time, might result in great disadvantages; as a fact, this principle can and does admit of exceptions. Professor Huxley has said that the value of universities is the education of the few persons of genius who appear during a century, and that their machinery is worthy of support for this purpose alone; geniuses, however, do not by any rule take advantage of the universities, but the universities are glad through titles to claim them as their own after they have shown their power. In like manner, a railroad which, like a country, needs to educate its officers, needs also some provision for getting its share of railroad ability which is born but not made.

As respects those influences upon promotions which naturally come through the road as a financial organization, we have the strong proof of fact to substantiate our statement that they are inadequate to place in position any officer who does not possess fitness. The strength of the organization allows of individuals in position where hopefulness for the future rather than proved and tried experience has determined appointment; but reasons for this appointment exist in the policy of the road. The Pennsylvania Railroad has an individuality of method and official conduct which is more easily taken on a young and less experienced mind than by men already trained in other types of organization. In saying this it should be understood that we claim no superiority for that plan of organization existing as the Pennsylvania Railroad Company. Its excellence is that it has grown out of the facts of its own individual conditions and is admirably fitted and adjusted to these. It has been said there is no "true form" of government, simply because the excellence of any form depends upon the requirements needed to give order and stability of life to those who are governed. The one bad type of government and organization is that which either for want of power, or by reason of unlimited personal power, can have no progressive development necessary to the well-being of those governed. The bad and poor type of railroad organization is that one alone which does not fit nor develops to the changing facts of the road. We ask pardon for so much statement, but our boldness needs the temper of discretion, as we are perhaps too anxious to convince the reader. There is another informal tradition which we discover in the facts of appointments and which modifies others of which we have spoken.

An exaggeration is possible, in technically educated minds, of the value of single qualities or sets of qualities as developed by training. All positions of importance involve a kind of ability in their proper performance which only a man of general rather than special and one-sided view of life develops, namely, ability to get on with, to submit to, and to control human beings. We judge it to be the experience of this great road that no special training or ability will fit a man for office who has not that balance of character and general interest in life which enables him to get on with all varieties and conditions of men, and at the same time carry out the rules of the organization; especially this one, that interference is uncalled for, exercise of authority and correction of mistakes by subordinates needing only the usual and ordinary machinery. To speak definitely, no officer without that self-control which enables him to work through the regular lines of authority can gain any position upon this road, unless we are mistaken in facts which alone are our authority.

This valuing of general rather than special ability we believe to be a marked feature of the road. No company exaggerating training and experience to the theoretical degree, to which the German mind is especially prone, could repeat, as to its important facts, the history of the Pennsyl-

vania Railroad as to appointments and elections. One of the most admirable features of this informal organization of which we are speaking is this balance of principle against principle, which impresses the mind as the result of genius; but which, as a fact, is merely the result of the untrammelled and interested activity of a large number of individual men, living and dead. On every side the Pennsylvania Railroad would be weak by excess were it not on the opposite side strong.

It remains only to speak of the President of this great organization, and in relation to him of those outlying organizations which only through him form a unit of control with the Pennsylvania Railroad Company. The responsibilities and duties of this officer are almost too great to be borne by any one man who desires faithfully to fulfil them and not die an early death. What may be the facts we do not know, but there is reason to believe that the vice-presidents of so great an organization need and have a freedom of initiative and independent action which might be unnecessary in smaller companies. As regards the mere details of present interests, aside from extensions, the labor falling upon the President must be enormous considering its character and quality—namely, a series of decisions.

The Pennsylvania Company, operating the lines west of Pittsburgh controlled by the Pennsylvania Railroad Company, is governed by an Executive Committee, of which the First Vice-President of the Pennsylvania Company is chairman, but which is responsible in fact to the President of the Pennsylvania Railroad Company. It is not our purpose to enter into the details of the duties of this committee, nor of the Third and the Fourth Vice-Presidents of the Pennsylvania Railroad Company as regards the practical operation of these lines. It is sufficient to observe that their gross receipts approach those of the combined older lines operated directly by the Pennsylvania Railroad Company.

Should opportunity allow, the features of other organizations will be studied with the same purpose for which this study has been made, namely, to give those lacking the time for such investigation, especially younger men, some of the facts concerning existing organizations. In this work, which to a very limited extent has been attempted for several roads, opportunity has been taken to obtain the views of those whose long experience, position and capacity enabled them to speak with authority about railroad questions. Embodied in this account of the Pennsylvania Railroad Company are the views of those whose experience has been gathered upon other roads; and in the expression of these views we have taken occasion to examine the facts found in the documents relating to our subject. We have not, however, found any officer able to speak for the Pennsylvania Railroad as an organization; but the views expressed have a basis in the practical working facts and views existing in many, very many minds.

This paper is specially indebted, however, to the library of the Historical Society of Pennsylvania, an institution in which railroads should take greater interest, as it already possesses documents growing greater in value with the passing away of years and men.

THE SCRAP HEAP.

A German Exhibition of Railway Appliances.

In describing the exhibition of railway appliances at the Bavarian National Exhibition at Nuremberg, the *Engineer* says:

"The most remarkable series of objects in this section, and perhaps in the whole exhibition, is the collection shown by the State Railway departments, in which it has been sought to illustrate every detail connected with the construction, working and management of a great railway. The state lines at the end of 1881 included about 2,650 miles, with a rolling stock of 1,013 locomotives, 7,429 passenger carriages and post-office tenders, and 15,982 wagons of all kinds. The collection is so voluminous that the mere enumeration of the objects occupies 10 closely-printed columns of small type in the catalogue. Commencing with laying out, the instruments used in surveying are shown, together with excavating or mining tools, a train of narrow gauge trucks and engine for earthworks, examples of difficult construction in mountainous regions, among which is particularly to be noticed a system of iron frames or centering used in a tunnel through very loose ground in the Fichtelgebirge, plans of all the principal stations and repairing shops, etc. In the rolling stock department the details of engine and wagon construction are shown by individual examples in various states of completion, together with a very interesting series of objects worn out in service. Among these are some very primitive arrangements used in early times, such as axle boxes with wooden springs, and buffers packed with straw. A full-sized locomotive boiler, built in 1852 and put out of use in 1879, is shown in complete longitudinal section, the cutting having been so carefully done that the scale on the tubes and fire-box surfaces is not disturbed; the condition of the boiler as it was when last at work being faithfully represented. Outside the main building the method of laying iron permanent way is represented by a construction train, consisting of traversing crane wagon, with winch for hauling the lengths of rail with their longitudinal bearers attached; a rail wagon, in which 20 lengths of rails are carried in racks, and a second wagon with cross sleepers, tie rods, bolts, and small stores. The crane is 18.2 metres (59.7 ft.) long, with a lifting power of 1,650 kilos. (3,630 lbs.) and by its use a gang of 30 to 40 men are able to lay and finish about 1,200 metres (3,936 ft.) of single line daily. The system adopted is that of a continuous longitudinal bearing, the ends of the rails being separated by cross pieces of four-armed angle section, the fourth arm only projecting about 1/2 in. from the slot between the rail ends. The gauge is kept by tying the rails together with a tension rod, connecting their stems in mid-length. The rails are steel-headed, in 9 metre (29.52 ft.) lengths, weighing 25.7 kilos. (56.5 lbs.) per metre; the longitudinal iron sleepers without a middle rib weigh 23 kilos. (50.6 lbs.) per metre, and the transverse angle iron stops 14.4 kilos. (31.6 lbs.) each. Up to the present time 57 kilometres (35.4 miles) have been laid, a further length of 319 kilometres (198.2 miles) having been laid on Hill's system, with iron longitudinal and transverse bearers of equal section. Another system with transverse sleepers, by Roth & Schuler, which is still in the experimental stage, is also shown.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings will be held as follows:
Boston & Lowell, annual meeting, at the passenger station in Boston, Jan. 8.
Columbus, Hocking Valley & Toledo, annual meeting, at the office in Columbus, O., Jan. 9.
New York, New Haven & Hartford, annual meeting, in New Haven, Conn., Jan. 10.
Philadelphia & Reading, annual meeting, in Association Hall, Philadelphia, Jan. 8, at noon.

Dividends.

Dividends have been declared as follows:
Cincinnati, Hamilton & Dayton, 3 per cent., semi-annual, payable Jan. 5.
Lake Shore & Michigan Southern, 2 per cent., quarterly, payable Feb. 1. Transfer-books close Dec. 29.
Michigan Central, 2 per cent., payable Feb. 1. Transfer-books close Dec. 29.
Vermont Valley, 3 per cent., semi-annual, payable Jan. 1.
Worcester & Nashua, 1 1/2 per cent., semi-annual, payable Jan. 1.

Foreclosure Sales.

The sale of the *Williamstown* road, which was to have taken place Dec. 23, has been adjourned until March 24, 1883, at Woodbury, N. J. It was from Atco, N. J., to Williamstown, 9 miles. There is a report that the road may be bought in the interest of the New Jersey Central, a spur of whose Southern line runs to Atco, and that it will then be extended through Glassboro to the Delaware River.

American Society of Civil Engineers.

The thirtieth annual meeting of the Society will be held in New York, on Wednesday, Jan. 17, 1883, at 10 a. m. The annual reports will be presented, officers for the ensuing year elected, time and place for the next annual convention considered, proposed amendments to the constitution discussed, and other business transacted. Arrangements for Jan. 17 and 18 will be perfected by a Committee.

Members are requested to inform the Secretary whether they intend to be present or not.

Master Mechanics' Association.

The Supervisory Committee have decided that the next annual convention of the Master Mechanics' Association shall be held in Chicago on the third Tuesday in June (19th), 1883. President Wells has appointed the following Committee of Arrangements: E. T. Jeffrey, Illinois Central; Jacob Johann, Wabash, St. Louis & Pacific; James M. Boon, Chicago & Northwestern.

ELECTIONS AND APPOINTMENTS.

Chicago, St. Paul, Minneapolis and Omaha.—Capt. T. P. Gere has been appointed Assistant to General Superintendent Charles F. Hatch. Mr. Arthur A. Hobart succeeds Capt. Gere as Superintendent of the Eastern Division. Mr. Hobart has seen service on the Chicago, Burlington & Quincy, the Chicago & Northwestern, the Troy & Boston, the Boston & Lowell, and recently as Superintendent of the Chicago Division of the Wabash.

Cleveland, Youngstown & Pittsburgh.—The officers of this company are: President, H. W. Ford, New York; Vice-President and General Manager, W. R. Bergholz, New York; General Superintendent, W. E. Lewis.

Denver & New Orleans.—Mr. C. W. Fisher has been appointed General Manager, with office in Denver, Col. He was recently on the Union Pacific road.

Grand Trunk.—The following circular is dated Dec. 15: "Mr. J. D. McIlwain, General Foreman of the Car Department, has been appointed Assistant Mechanical Superintendent of the Great Western Division (under Mr. Domville), and will have charge of all matters relating to the repairs and inspection of cars at outside stations, in addition to the duties he is at present performing at London. All requisitions for material and reports relating to cars, repairs and inspection, should be addressed to Mr. McIlwain at London, Ont."

Maine Central.—At the annual meeting last week the following directors were elected: Abner Coburn, Darius Alden, William B. Bacon, William G. Davis, George E. B. Jackson, Horatio N. Jose, George S. Morison, Willard P. Phillips, Arthur Sewall, Stephen J. Young, Lyander Strickland, Jonas H. French, Thomas W. Hyde. At a meeting of the new board George E. B. Jackson was chosen President for the coming year, and J. H. Drummond Clerk.

New York & Boston Inland.—The Connecticut company of this name has elected officers as follows: President George Cook, New Haven, Conn.; Treasurer, J. H. Boardman, Birmingham, Conn.; Secretary, George E. Spare, New Haven.

New York & New England.—The new board has re-elected James H. Wilson President; S. M. Felton, Jr., General Manager; J. W. Perkins, Secretary; George B. Phippen, Treasurer; Erastus Young, Auditor.

New York, New Haven & Hartford.—Mr. Otis Leckey is appointed Assistant Superintendent of Motive Power, with office in Hartford, Conn. He has been an engineer on the road for many years.

Northern Central.—Mr. Wm. E. Fraser is appointed Freight Agent at Buffalo, N. Y. He has been Traveling Agent for several years.

Northern and Hamilton & Northwestern.—Mr. Samuel Barker has been appointed General Manager in place of Walter Townsend, who has been acting in that position since the death of Col. Cumberland. Mr. Barker was formerly Solicitor of the Great Western Railway.

Pittsburgh, Cincinnati & St. Louis.—Mr. C. G. H. McBride is appointed Traveling Passenger Agent for this company, with headquarters at Zanesville, O., in place of Mr. J. J. Mohler, transferred. Mr. McBride will report to Mr. F. M. Caldwell, District Passenger Agent, Columbus, for instructions.

Texas & St. Louis.—It is said that Mr. George W. Ristine will be made General Manager of this road. He was formerly General Manager of the Empire Line, and has been recently with the Denver & Rio Grande.

Thomasville.—The directors of this new company are: Edward Lewis, Tallahassee, Fla.; John Bradford, Bradfordville, Fla.; A. P. Wright, Thomasville, Ga.; Edward Danforth, Elmira, N. Y.; C. D. McDougall, Auburn, N. Y.; John E. Page, J. Edmund Page, Wm. V. Page, Albany, N. Y.; Charles H. Adams, New York.

Union Pacific.—Mr. J. A. Munroe has been appointed Assistant General Freight Agent of all lines and branches operated by this company, with headquarters at Omaha.

Utica, Ithaca & Elmira.—Mr. C. R. Fitch, late of Brooklyn, has been appointed Superintendent of this road, with office in Elmira, N. Y.

Vandalia, Hillsboro & Springfield.—The directors of this new company are: Beverly W. Henry, Richard T. Higgins, Vandalia, Ill.; Wm. H. Bremer, James M. Truitt, Hillsboro, Ill.; J. P. M. Howard, Edward T. Rice, Springfield, Ill.

PERSONAL.

—Mr. J. T. Sanford has resigned his position as Freight Traffic Manager of the Chicago, Rock Island & Pacific road, to take effect Jan. 1, and the office will probably be abolished. Mr. Sanford resigns on account of ill health, and will go to California for a time.

—It is reported that Mr. Payson Tucker, now Superintendent of the Maine Central, is to be General Manager of the Eastern Railroad, a new office.

TRAFFIC AND EARNINGS.

Railroad Earnings.

Earnings for various periods are reported as follows:

Eleven months ending Nov. 30:

	1882.	1881.	Inc. or Dec.	P. c.
Cin., I., St. L. & C.....	\$2,418,174	\$2,109,563	I.	218.611
Cin., N. O. & Tex. P.....	2,334,542	2,121,450	I.	213.092
Eastern.....	3,182,828	2,939,107	I.	223.721
Marq., Hough. & Ont.....	1,164,724	884,519	I.	300.205
Nash., Ch. & St. L.....	1,745,065	1,902,131	D.	135.436
Net earnings.....	700,227	704,703	D.	4.476
Northern Central.....	5,310,173	4,967,077	I.	343.006
Net earnings.....	1,920,165	1,501,265	I.	427.900
Pennsylvania.....	44,922,667	40,392,434	I.	4,530.233
Net earnings.....	17,247,577	16,211,182	I.	1,036.395
Rich. & Danville.....	3,335,472	3,205,904	I.	129.568
South Carolina.....	1,164,736	1,119,226	I.	45.610
Va. Midland.....	1,308,977	1,214,191	I.	92.816
Nine months ending Sept. 30:				
St. Johnsbury & L. C.....	\$190,104	\$157,394	I.	\$32,710
Month of September:				
St. Johnsbury & L. C.....	\$20,814	\$25,824	I.	\$990
Month of November:				
Cin., Ind. St. L. & Chi.....	\$219,732	\$211,014	I.	\$8,718
Cin., N. O. & Tex. Pac.....	242,932	225,937	I.	16,995
Eastern.....	266,000	273,067	D.	7,067
Marq., Hough. & Ont.....	90,891	66,051	I.	24,840
Nash., Ch. & St. L.....	181,338	152,059	I.	29,277
Northern Central.....	526,085	487,160	I.	39,925
Net earnings.....	148,230	173,457	D.	25,227
Oregon & Cal.....	112,000			
Pennsylvania.....	4,373,825	3,840,215	I.	533,610
Net earnings.....	1,602,361	1,460,343	I.	142,018
Rich. & Danville.....	362,922	377,711	D.	14,789
South Carolina.....	151,081	124,309	I.	17,772
Virginia Midland.....	129,389	118,538	I.	9,851
Second week in December:				
Ches. & Ohio.....	\$58,081	\$43,926	I.	\$14,155
Chi. & Eastern Ill.....	31,902	35,172	D.	3,270
Chi. & Gd. Trunk.....	55,764	36,308	I.	19,456
Third week in December:				
Denver & R. G.....	\$100,300	\$150,300	D.	\$50,000

Grain Movement.

For the week ending Dec. 16 receipts and shipments of grain of all kinds at the eight reporting Northwestern markets and receipts at the seven Atlantic ports have been, in bushels, for the past nine years:

Year.	Northwestern receipts.	Northwestern shipments.	Atlantic receipts.
1874.....	1,872,271	562,345	1,338,420
1875.....	2,231,724	788,772	1,495,791
1876.....	2,711,045	1,168,217	1,841,227
1877.....	3,219,829	1,377,864	2,228,610
1878.....	3,072,744	1,590,045	3,143,071
1879.....	3,040,974	1,261,537	3,473,439
1880.....	5,012,357	1,437,618	3,212,258
1881.....	3,324,829	1,713,134	2,161,922
1882.....	4,658,829	1,888,188	2,500,117

The receipts of the Northwestern markets for the week were thus larger than in the corresponding week of any previous year except 1880; they were 602,000 bushels less than the week before. The shipments of these markets were larger than in the corresponding week of any previous year, but smaller than in the previous week of this year. Of ten shipments 61,431 bushels (3.3 per cent.) went down the Mississippi. The Atlantic receipts were a fifth larger than in the corresponding week of last year, but with that exception were the smallest since 1876.

Of the Northwestern receipts for the week Chicago had 49.4 per cent., St. Louis 46.7, Boston 11.8, Peoria 7.8, Detroit 5.2, Toledo 4.7, Duluth 2.7, and Cleveland 1.7 per cent. The chief decrease from the previous week is at Chicago and St. Louis.

Of the Atlantic receipts New York had 49.9 per cent., Baltimore 21.1, Boston 12.9, Philadelphia 10.6, New Orleans 4.1, Portland 1, and Montreal 0.4 per cent. There is a decrease at all important places.

Of the exports of this week (2,308,272 bushels) 50.2 per cent. went from New York, 38.4 from Baltimore, 7.4 from Boston, 6.2 from Philadelphia, 1.6 from Portland, and 1.2 from New Orleans.

The exports for the week ending Dec. 20 were:

	1882.	1881.	1880.
Flour, bbls.....	212,276	62,049	138,389
Grain, bush.....	2,110,699	1,262,107	2,363,848
Flour and grain, bush.....	3,065,941	1,541,327	2,986,598

Taking flour and wheat together, therefore, the exports this year were larger than in 1880 even, which has hardly happened before in 1882. Corn now for the first time for many months makes a considerable figure in the exports, the shipments this week having been 555,069 bushels—about equal to the aggregate exports of the three weeks previous.

For the week ending Dec. 23 receipts and shipments at Chicago & Milwaukee were:

	Receipts.	Shipments.
Chicago.....	1882. 2,454,823	1881. 1,961,374
Milwaukee.....	610,775	598,457

Both..... 3,065,598 2,559,831 1,365,020 1,473,363

The receipts were thus about 20 per cent. greater than last year; the shipments 7 per cent. less. This year more than half the Chicago receipts were corn.

For the week ending Dec. 16 receipts at four Eastern ports have been:

Bushels:	New York.	Boston.	Phila.	Baltimore.	Total.
1882.....	1,042,256	293,045	309,900	512,985	2,158,186
1881.....	686,022	315,513	229,075	462,226	1,692,837
1880.....	1,518,698	476,572	413,200	586,663	2,995,103

P. c. of total:
 1882..... 48.3 13.6 14.3 23.8 100.0
 1881..... 40.5 18.6 13.6 27.3 100.0
 1880..... 50.7 15.9 13.8 19.6 100.0

Philadelphia and Baltimore together received 38.1 per cent. of the whole this year, against 40.9 last year and 33.4 in 1880.

War Rates and Lumber Business.

The *Northwestern Lumberman* of Dec. 21 says: "The most salient feature of the trade in the Northwest during the past week, like the week previous, has been the effort to push stocks to the Missouri on the low freight rates. A large aggregate of lumber has gone forward from all markets affected by the cut rates, but no doubt considerable demoralization has resulted from the scramble. Some points

that did not enjoy the nominal rates have been left out in the cold and dealers at such places have chafed in dull offices, while their more fortunate neighbors have been unloading their yards. Values, of course, have been shaken up badly and it will be some time before anybody will really know what lumber is worth. The outcome of the freight war will be that a future demand has been somewhat anticipated, a condition that will react on business later on. The lumber that has been purchased since the low rates prevailed has been secured cheaply enough so that it will be hard for wholesalers to tone up prices toward spring if they should so desire. Retail yard men have become so accustomed to demoralization and cut prices, to having extra inducements held out to them to purchase that it will hereafter be difficult to make them believe that the wholesale trade has any backbone in it. In this way the cut rates and demoralized lines of trade and prices have been a general evil, and the more emphatic because it is well understood that the surplus in the markets is unusually large. A better condition would have resulted if there had been no cut rates and trade had been confined to the supply of a current demand. It now seems that no locality where the low freight rates have prevailed has been benefited more than another. Chicago complains of the competition of the Mississippi River markets and both of the upper river points. All have gone into the slaughter and all have sold lumber on a diminutive margin. All can rest assured that they have knocked about the last prop from under tottering lumber values and that prices will be weaker all winter and probably next spring because of the abnormal spurt that closed this season.

Coal Movement.

Coal tonnages for the week ending Dec. 16 are reported as follows:

	1882.	1881.	Inc. or Dec.	P. c.
Anthracite.....	605,939	634,797	D. 28,858	4.6
Semi-bituminous.....	102,605	107,985	D. 5,380	5.0
Bituminous, Pa.....	76,767	77,112	D. 345	0.5
Coke, Pa.....	55,931	58,382	D. 2,451	4.2

There is a general, but slight, decrease in the coal trade everywhere.

The coal tonnage of the Pennsylvania Railroad for the week ending Dec. 16 was: Coal, 173,585; coke, 55,931; total, 219,516. The total tonnage this year to Dec. 16 was 10,645,690 tons.

Petroleum.

The production of the Pennsylvania and New York oil regions in November is reported as follows by Stowell's *Petroleum Reporter*, in barrels of 42 gallons:

	1882.	1881.	Inc. or Dec.	P. c.
Production.....	2,192,940	2,266,830	D. 73,890	3.3
Shipments.....	1,404,640	2,066,906	D. 661,266	32.0
Stock, Nov. 30.....	33,728,555	25,509,285	I. 8,219,270	32.2
Producing wells.....	18,700	18,040	I. 660	3.7

The production is smaller than for any preceding month of this year, and was exceeded in 10 out of 12 months of last year, and in four months of 1880. Of the total the Allegheny Region in New York furnished 21.9 per cent.; the Bradford District, 58.4; the Middle districts in Pennsylvania, 12.1, and the Southern districts 12.6 per cent.

The shipments were lighter than for any month since May, 1881, and were exceeded in four months of 1880.

The stock reported is all in the pipe lines. The increase in stock during the month was 788,300 barrels.

The number of producing wells reported is a decrease of 800 from October and of 900 from September. There were 150 new wells completed during the month, and 154 more drilling Nov. 30. The number of new wells in progress is less than one-third of that reported a year ago.

The shipments out of the region for the month were as follows:

	Barrels.	Per ct. of total.
New York.....	532,334	30.3
Philadelphia.....	183,797	13.1
Cleveland.....	239,863	17.1
Pittsburgh.....	51,602	3.6
Local points.....	182,338	13.0
Refined at Creek refineries.....	194,706	13.9
Total.....	1,404,640	100.0

No shipments of crude were reported during the month to Boston or Baltimore.

Of the oil refined at Creek refineries (reduced to its equivalent in crude), 56,259 barrels went to New York, 11,250 to Philadelphia, 300 to Baltimore, 58,072 to Boston, and 68,825 to local points; total, 194,706 barrels.

Of the shipments from the wells 605,863 barrels were by rail and 798,972 barrels by pipe line. The largest rail shipments were 179,063 by the Philadelphia & Erie, and 144,749 by the Allegheny Valley. Of the pipe shipments 296,889 barrel were by the Seaboard Pipe Line, 208,460 by the Tidewater Pipe Line, and 200,000 barrels by pipe to Cleveland. The rail shipments last month were an unusually large proportion of the whole.

Prices were kept down by the opening of two very large flowing wells in a new district in Forrest County, Pa., running together about 3,000 barrels a day.

Chicago-Ohio River Pool.

A meeting was held in Cincinnati last week for the purpose of making a new division of business. As each of the roads in the pool wanted to have an increased share, this proved somewhat difficult. Finally a resolution was adopted to continue the pool until April 1, any member meanwhile having the right to demand a called meeting on 30 days' notice for a reconsideration of percentage.

OLD AND NEW ROADS.

Atchison, Topeka & Santa Fe.—Notice is given that the 8 per cent. land income bonds issued Jan. 1, 1878, will be paid at the company's office in Boston on and after Jan. 1, 1883; interest will cease from that date. There are \$438,500 of these bonds outstanding.

This company has just negotiated a loan with Kidder, Peabody & Co. for \$1,500,000, issuing that amount of its new 6 per cent. collateral trust bonds. The Atlantic & Pacific Railroad Company will need about \$1,000,000 in addition to its recent subscription for \$6,000,000 in order to complete its line with full equipment to the Colorado River. This amount will probably be advanced by the two stockholders—the St. Louis & San Francisco Railroad Company and the Atchison, Topeka & Santa Fe in equal proportions. These companies have already agreed to advance \$250,000 each, and as the Atchison Company has further need for bonds it has been thought best to keep clear of a floating debt by issuing more of the \$10,000,000 collateral 6 per cent. bonds lately authorized, one-half of which was taken abroad last Spring at about 102½.

Atlantic & Pacific.—The reported embarrassments of this company, it is stated, originated in a difficulty with a large tie contractor, who claimed that, under his contract he was entitled to a higher price than the company had paid him, and accordingly began suit to recover, at the same time put attachments on the company's property. Officers of the company state that all the money needed to complete the road to the Colorado is provided for. The January interest will be promptly paid.

Bedford, Springfield, Owensboro & Bloomfield.—A proposition for the purchase of this road, which is now owned chiefly by the Indianapolis Rolling Mill Company, and it is to be considered at a meeting of the board next week. It is understood that the offer to buy comes from the Pennsylvania Company. The road is a narrow-gauge line running across from Switz City, Ind., on the Indianapolis & Vincennes, to Bedford, on the Louisville, New Albany & Chicago. It has had but a small business, having no outlet at either end.

Boston & Albany.—This company purposes making a change in its suburban package system. In common with other roads running from Boston, the company has been accustomed for some years to receive and care for bundles for people who desired such accommodation. And out of this custom has grown the practice of not only taking care of boxes and baskets of provisions and groceries, but transporting them to the various stations along the road, keeping them in the baggage rooms until called for. It is now decided to make a small charge for such accommodation, the rates and terms to be fixed before the plan is put into effect.

Boston, Hoosac Tunnel & Western.—A dispatch from Boston, Dec. 22, says: "When Gen. Burt, in furtherance of his plan for giving Boston and Massachusetts an independent connection with Buffalo and the lakes via the Hoosac Tunnel and Mohawk Valley, executed a year ago, a contract with the Continental Construction Company to double-track the Boston, Hoosac Tunnel & Western Road, already built between the Massachusetts state line and the Hudson River, and to extend it with a double track to Buffalo and Oswego, \$8,000,000 first-mortgage bonds were executed and placed with the Central Trust Company at New York to secure the Construction Company. The contract calls for the completion of the work by next July, but very little work has been done, and probably no more will be accomplished owing to dissensions among the members of the Construction Company. Learning that the company proposed to divide these bonds among their subscribers Jan. 1, some of the stockholders of the railroad company have petitioned the directors of the road to protest against the division of the bonds, as proposed, upon the ground that the Continental Construction Company had wholly failed in the performance of its contract. It is supposed that the Construction Company has gained possession of nearly all the capital stock of this railroad, except a few hundred shares. The holders of these, however, claim that, as a construction company cannot lawfully own shares in a road which they have contracted to build, only the stock of individual owners possesses the voting power."

Boston & Maine.—A Boston rumor is to the effect that negotiations have been opened for the consolidation of the Boston & Lowell with this company. The two roads compete for local traffic at Lowell and Lawrence, but their through business is on entirely different lines. The main object is said to be the use of the Lowell passenger station and terminal facilities in Boston, which are ample for both companies.

Brunswick & Albany.—At a meeting held last week in Brunswick, Ga., the new owners of this road (the Erlanger or Alabama Great Southern syndicate) organized the Brunswick & Western Company. It was resolved to proceed at once with the extension of the road from Albany, Ga., west to the Chattahoochee River.

Buffalo, New York & Philadelphia.—The directors have approved an agreement of consolidation with the Buffalo, Pittsburgh & Western Company, as noted elsewhere.

Buffalo, Pittsburgh & Western.—At a special meeting held in Philadelphia, Dec. 21, the directors of the Buffalo, Pittsburgh & Western and Oil City & Chicago Railroad companies, two corporations in name but one in fact, adopted resolutions providing for a consolidation with the Buffalo, New York & Philadelphia and the Olean & Salamanca Railroad companies, under the name of the Buffalo, Pittsburgh & Western. The directors of the Buffalo, New York & Philadelphia and Olean & Salamanca companies met in New York, Dec. 22, and took similar action. A special meeting of the stockholders of the Buffalo, Pittsburgh & Western has been called to meet Jan. 4 to ratify the merger, but it will be a mere matter of form, as their approval has already been secured. The terms of the merger are that all the stock of the Buffalo, New York & Philadelphia, the Olean & Salamanca, and the Oil City & Chicago companies shall be canceled and new stock of the Buffalo, Pittsburgh & Western be issued in its place dollar for dollar. This merger adds 344 miles of road to the Buffalo, Pittsburgh & Western system and increases its capital about \$13,000,000, but reduces the mileage capital of the whole system over \$15,000 a mile.

The Buffalo, Pittsburgh & Western and the Buffalo, New York & Philadelphia have been under substantially the same ownership for some time past. The Genesee Valley road is included in the consolidation, under the lease to the Buffalo, New York & Philadelphia Company.

Chicago, Iowa & Dakota.—Track has been laid on this road from Eldora Junction, on the Chicago & Northwestern's Northern Iowa Division, westward to Eldora, 5½ miles. It is proposed next season to extend the road by Iowa Falls and Belmont to Forest City, about 80 miles. Some 30 miles of the line will be on the old Iowa Pacific grade.

Chicago & St. Louis.—It is stated that the object of this newly organized company is to build from Litchfield, Ill., on the St. Louis, Alton & Terre Haute, north about 45 miles to Springfield, where connection will be made with the Illinois Central's Springfield Division.

Cincinnati, Hamilton & Dayton.—This company makes the following showing for the six months ending Sept. 30:

Earnings from all sources.....	\$1,549,308.23
Operating expenses, taxes, etc.....	1,025,560.58
Net earnings.....	\$523,747.65
Fixed charges for interest and guaranteed dividends to Sept. 30.....	397,400.24

Balance..... \$126,308.41

Out of this residue a semi-annual dividend of 3 per cent. on the unguaranteed portion of the common stock has been declared, payable Jan. 5, 1883.

Clearfield & Western.—The Philadelphia Railway World of Dec. 23, after describing the extent to which the Pennsylvania Railroad Company has built lines to serve the bituminous coal fields of Pennsylvania, especially the Clearfield district, and stating that railroads have never become owners of great bituminous coal properties, as they have of anthracite mines, says:

"A new departure, which will vitally affect these operations, is now announced and progressing. It is the most important of general movements which threaten to expand, on an imposing scale, to the semi-bituminous and bituminous coal districts the system of dual management, or of combining coal-mining with coal transportation functions,

which has proved so disastrous, in many of its workings, in the anthracite districts of Pennsylvania. It is said that Mr. Vanderbilt has purchased either the coal right or the fee-simple title to about 33,000 acres of Clearfield County coal lands, and that a railway will soon be constructed under his auspices which will reach these lands. The projected line will, it is reported, start from Jersey Shore, a short distance west from Williamsport, and run in a south-westerly direction through Clinton, Centre and Clearfield counties. The line will be almost directly parallel with the Bald Eagle Valley Railroad, but further north or north-west. One of our contemporaries recently stated that Mr. Vanderbilt expects to ship 3,000,000 tons annually from the Clearfield region alone. As usual in such enterprises, a number of citizens of Clearfield County, and some of the shippers of coal who are now using the lines of the Pennsylvania Railroad Company, desire the success of the new enterprise. That it will have an important effect in developing the resources of extensive semi-bituminous districts can scarcely be doubted. Whether the interest of the parties heretofore and at present engaged in mining and shipping Clearfield coal will be advanced remains to be determined by the future course of events. They are apparently threatened with a form of rivalry which may prove decidedly prejudicial to their future welfare. At present a very large proportion of their product is forwarded eastward to consumers who consist largely of railway companies in which Mr. Vanderbilt is deeply interested, and New England lines and manufactories which may more readily become purchasers of coal mined in his mines and carried to market over his railways, than of Clearfield coal of like quality which is transported over a competing railway system. The Clearfield region, therefore, seems destined to become the scene of conflicts between individuals, firms, or coal companies proper, on the one hand, and combined mining and transportation companies on the other, and analogous to those which have been of such frequent occurrence in the Schuylkill and other anthracite coal regions, and which have so often resulted in the ruin of private coal operators and great embarrassment of coal mining and coal carrying companies."

From this it might appear that Mr. Vanderbilt is the first to unite a coal carrying enterprise with a great bituminous coal property. But in this he was preceded by the Erie, whose coal mines near Daguerstown were bought about ten years ago by President Watson, and this year have been provided with a new rail outlet to the Erie's line, part of which were mapped recently. The "New York, Lake Erie & Western Coal & Railroad Co.," also proposes to mine 3,000,000 tons of coal, and if it and Mr. Vanderbilt's mines each put that quantity in the market soon, doubtless the individual owners of coal mines will much dislike their competition.

Cleveland, Delphos & St. Louis.—New organizations have been completed to build extensions of this road. One, called the Pittsburgh & Maumee, is to run from Columbus Grove, O., west by north, 40 miles, to Antwerp on the Wabash road. The other—the Pittsburgh, Akron & Chicago—is to run from Medina, O., eastward through Akron to Youngstown, about 65 miles. Both have the same officers as the Cleveland, Delphos & St. Louis and will be consolidated with that company.

Cleveland, Youngstown & Pittsburgh.—The Pittsburgh Telegraph says: "On July 14 last, the Cleveland, Youngstown & Pittsburgh, the Alliance & Lake Erie and the Steubenville, Canton & Cleveland Railroad Companies effected a consolidation under the name of the Cleveland, Youngstown & Pittsburgh Railroad Company. Of the three companies named, the Alliance & Lake Erie was the only one that had constructed any part of this line. They have been operating for several years a narrow-gauge road running from Alliance through the Palmyra coal field to Phalanx, a point on the New York, Pennsylvania & Ohio road, 25 miles from Alliance. They are compelled to reship all coal and freights at either end of their line at Phalanx and at Alliance. Two passenger trains are run daily each way. The road has been widened preparatory to making it a standard gauge road which will probably be done next June, when entire new equipments will be placed on the road. The line of the new company as now surveyed will be as follows: Starting from Phalanx, in Portage County, it passes through a rich agricultural region, as well as the Palmyra coal field, 25 miles to Alliance, where it will have connection with the two roads above named; thence 5 miles to Paris, 6 miles to Minerva, 3 miles to Augusta, 7 miles to McCannocksburg, 6 miles to Wattsville, 4 miles to Nebo, 8 miles to Springfield, 3 miles to Richmond, 14 miles to Brown's Island, on the Ohio River, and 6 miles down to Steubenville, giving them 91 miles of continuous road through three counties in Eastern Ohio, and also tapping the undeveloped coal fields back of Steubenville and Salineville. The company has purchased the road bed of the narrow gauge road but recently built from Brown's Island towards Richmond, in Jefferson County, but will not use it, the curves being too sharp and the grades too heavy. They have a better route surveyed. At the present a construction force are working along the road and they expect to be able to commence operating the road as far as Nebo by July next. At this point it is thought large coal works will be opened up. The company expect to work further extensions, both from Steubenville and Phalanx, but at present nothing definite is known."

Connotton Valley.—Regular trains have begun running on the Straitsville Division from Canton to Beach City. The track is laid to Coshocton, O., 45 miles southwest from the junction with the main line at Canton.

Ft. Meade, Keystone & Walk-in-the-Water.—This company has been organized to build a railroad about 24 miles long from Ft. Meade, Fla., on the most practicable route to the waters on the west side of Weohyakapka, Walk-in-the-water Lake in Polk County, with a branch from Keystone to the waters of Arbuckle Lake.

Concerning this road a valued correspondent writes: "What's in a name? It has been left to Florida to have a railroad to walk in the water. It is a stupendous enterprise, quite mastodontic (this word is patented) in fact. Success to the F. M., K. S. & W. I. T. W. R. R."

Gainesville, Jefferson & Southern.—The branch of this road to Jefferson is now nearly all graded, and track-laying has been begun. On the extension of the Southern line the grading is finished for 12 miles southward from the end of the track at Jug Tavern, Ga., leaving five miles more of grading to reach Monroe, where connection will be made with the Walton Railroad.

Genesee Valley.—The first regular passenger train through from Rochester to Olean over this road was run Dec. 21, and trains will make regular trips hereafter.

Georgia Pacific.—An official statement of the progress of this road is as follows: "Track is laid for 80 miles from Atlanta to a point in Cleburne County, Alabama, from whence it is graded 25 miles further, which takes it through and 10 miles west of Anniston, situated on the Selma, Rome & Dalton Railroad. Track is laid from Anniston, 10 miles east, and soon through connection will be made between

Atlanta and Anniston. Grading is well under way between Anniston and Birmingham, situated on the Alabama Great Southern and the Louisville & Nashville railroads. From Birmingham the line is located into Fayette County, Ala., and from Columbus, Mississippi, the track is laid east, nearly through Lamar County, Ala., and the line well graded into Fayette County. From Columbus, Miss., west to Starkville, the road is in operation, crossing the Mobile & Ohio Railroad at Artesia. Between Starkville and Winona preliminary lines have been run, and the line located from Winona, Miss., which is on the Chicago, St. Louis & New Orleans Railroad, to the Mississippi River at Greenville. The road is built and in operation from Greenville, 25 miles east to Johnsonville, with a branch in operation from Stoneville, 20 miles south, to the Sharkey County line.

Housatonic.—A report is in circulation that Mr. Wm. H. Vanderbilt has bought a controlling interest in this road. It does not appear very probable, however, and needs confirmation.

Jersey Shore, Pine Creek & Buffalo.—A mortgage upon this road to cover an issue of \$3,500,000 bonds has been duly executed and recorded in the counties through which the road passes.

Kansas City, Springfield & Memphis.—The Kansas City, Fort Scott & Gulf has issued a circular to the holders of receipts for blocks of the Kansas City, Springfield & Memphis Railroad Company calling for 15 per cent. additional subscription toward the construction of the extension to Memphis. Changes of location for the better alignment of the road have increased its length six miles, making the total 218 miles from Springfield, Mo., to the Mississippi River. The great flood in the Mississippi in 1881 necessitated the raising of the grade and improvements in the bridge, etc.; the character of the work in Missouri and Northern Arkansas proved more difficult and expensive than at first anticipated, and the extensive business prospect led to provision for large terminal facilities in Memphis. All of these outlays will make the cost of the road about \$7,000,000, an increase, say, of 15 per cent. over the original subscription of \$6,000,000. The work on the various sections of the road is so far advanced as to leave no doubt of its being opened by June 30, 1883, ready for work, but it is proposed to issue the bonds as soon as legally practicable, and before the completion of the road. Subscriptions are to be for two thousand-dollar blocks, and are to be closed Jan. 10. Any stock remaining is to be disposed of by the Treasurer.

The tracklayers working from the Iron Mountain crossing at Nettleton, Ark., have reached the town of Jonesboro, 25 miles, and are still advancing steadily.

Keokuk & Des Moines.—It is announced that the rental received this year, under the lease to the Chicago, Rock Island & Pacific Company, will leave a surplus of \$3,710 only after paying interest, and that no dividend will be paid on the preferred stock. Last year 1½ per cent. was paid.

Marietta & Cincinnati.—The Cincinnati Commercial says of the order confirming the sale, as entered last week: "The order for the confirmation of the sale and the distribution of the proceeds of the sale, as moved by Mr. McClintick, takes no notice of the notification given by Marietta parties as to the reopening of the old line to that place. It leaves the amount of compensation to the Master Commissioners who sold the property blank, and provides for a moderate compensation for the officers of the company while the property has been in the hands of a receiver."

"The principal question argued was as to the method of receiving a sufficiency of the proceeds of the sale under the control of the Court, under an act passed in February, 1882, in order to meet contingent claims of certain furnace companies and other creditors, who claimed that they had actions pending which, when finally determined, would have priority of lien over the mortgage creditors. Those contingent claims amount to over \$200,000, and it was proposed to suspend the payment of \$280,000 of the purchase money until the question as to such priority of lien should be finally determined, and that the same should remain a lien on the road in the hands of the purchasers and bearing interest until required to be hereafter paid into Court. The furnace companies object to this and want the money deposited in Court and retained by it under its direct custody. This question has not yet been decided by the Court."

"The decree makes provision for the payment of all the costs and expenses of the suit, and for all claims, debts and obligations against the Receiver, and for all taxes on the road in cash, and the Receiver will remain in possession until Dec. 31, 1883, when possession will be turned over to the purchasers, and afterwards the Receiver will continue to pay all lawful claims against them as presented, until the business is fully settled and he obtains a final discharge."

"The purchase price was \$4,875,000, \$100,000 of which has already been paid into Court, as well as \$3,392,200 of first-mortgage bonds, face value, with accrued interest since Feb. 1, 1878."

"After deducting the \$290,000 reserved for claims and \$100,000 paid to the Receiver, there remained \$3,285,000, of which \$1,479,840 was applied in the order of distribution to pay past due interest on the first mortgage and the residue was applied on the principal of the first-mortgage bonds, amounting to \$8,500,000, to be applied *pro rata*."

"All these bonds are held by the Reorganization Committee, except \$107,800, and the *pro rata* amount due on these last bonds was ordered to be paid to the first-mortgage Trustee, Colonel Orland Smith, who is required to publish notice and distribute the same according to the rights of the several holders, and make a report to the Court. But it is possible that the holders of many of these outstanding bonds will come into the reorganization, as it is alleged they will get a greater value in bonds of the reorganized company than they will get by taking their share of the proceeds of the present sale."

An appeal from the confirmation of the sale has been taken by parties representing the old Cincinnati & Hillsboro Company, which claims title to a part of the main line of the road.

Nantasket Beach.—The Massachusetts Railroad Commissioners have rendered a decision in the case of the selectmen of Hull and others, who had complained that all the trains on the Nantasket Beach Railroad had been discontinued, and ask that the trains, or a portion of them, be restored, and run through the winter season. The Commissioners express regret that the needs of the people of Hull cannot be supplied by the operation of the railroad in winter without disproportionate expense. They had hoped that by the use of an engine and car combined the expense might be so reduced as to render the operation of the road feasible. And the decision on the petition has been delayed with a view to inquiries upon this. Such a car would cost only \$4,000, and could be run at such a reduction of cost, as to employes and fuel, as to make the operating expenses only about \$1,500 for five months. Unfortunately no such car can be obtained for use this season. Before another winter the manager will have the opportunity to procure one, and they will be expected to provide for the reasonable wants of the people of Hull in this or some other way.

Nashville, Chattanooga & St. Louis.—This company's statement for November and the five months of its fiscal year from July 1 to Nov. 30 is as follows:

	November.	Five months.
Earnings.....	\$181,335	\$859,949
Expenses.....	99,615	495,298
Net earnings.....	\$81,720	\$364,651
Interest and taxes.....		232,361
Surplus.....		\$132,290

For the five months there was an increase of \$37,042, or 4.5 per cent., in earnings; a decrease of \$12,292, or 2.4 per cent., in expenses, and an increase of \$49,334, or 15.7 per cent., in net earnings.

New York, Pennsylvania & Ohio.—A dispatch from London, England, Dec. 21, says: "At the meeting of the shareholders and bondholders of the New York, Pennsylvania & Ohio Railway Company to day the large hall of the Cannon Street Hotel was closely packed. On Mr. Lewis assuming the chair there was considerable uproar, and Mr. Lee moved that Mr. F. W. Smith, Secretary of the London agency, take the chair. This motion was negatived by a show of hands amid great confusion, each party accusing the other of packing the meeting. Mr. Lewis expressed the hope that the bondholders would not be led away by unscrupulous schemers. He asked why the report ignored the great increase in traffic during the last few weeks. The Voting Trustees after some years of hard work had no intention of retiring. That practically was the real issue. As regards the voting power of the party opposed to the Trustees, namely, Lord Bury, Mr. Lee and Mr. Taylor, they had, on the faith of the report of Messrs. Allport and Swarbrick, secured votes representing \$4,290,000 first-mortgage bonds and \$5,000,000 second and third-mortgage bonds. The Voting Trustees had received \$16,000,000 first-mortgage bonds and \$12,000,000 second and third-mortgage bonds. Mr. Lewis moved the first resolution, which disapproves the committee's recommendation against applying the net earnings of the road to the part payment of coupons and the issue of deferred warrants for the unpaid balance. Lord Bury withdrew all opposition to the resolution, and it was carried unanimously. Mr. Allport justified the position he had taken up. He declared that the Manager in America was not fitted for his post. The great necessity for the property was complete fusion with the Erie road."

"Lord Bury moved an amendment to the second resolution. The amendment declares in favor of certain recommendations contained in Messrs. Allport and Swarbrick's report. It suggests the formation of a committee composed of Lord Bury and Messrs. Taylor and Lee to select the necessary trustees. Lord Bury declared that nothing had been done while the present Trustees had been in office. The amendment was negatived. A poll was demanded, which was fixed for Dec. 27. An amendment was also introduced against the third resolution, approving a close alliance, but deprecating a lease to the Erie Company, because such a lease would create a charge prior to the payment of interest on the mortgage. This amendment was also negatived and was referred to a ballot."

"Mr. Lewis charged Lord Bury's committee with being in collusion with Mr. McHenry."

Norfolk & Western.—A dispatch from Philadelphia, Dec. 26, says: "Mr. G. R. W. Armes, Secretary of the Norfolk & Western Railroad Company, said to-day that there was no truth in the reports circulated in New York of a large issue of new stock by the company, that no new stock has been issued and that no contract had been made for such issue. The Norfolk & Western and the Shenandoah Valley Railroad Companies are distinct corporations, but many of their officers and stockholders are identical. The two roads come together at Roanoke, Va., and a consolidation of the two companies has been talked of. In case they are consolidated the Shenandoah Valley stock, Mr. Armes says, will be canceled, and Norfolk & Western stock to an equal amount issued in its place. But a consolidation has not been determined upon, and probably will not be for some time to come."

North Shore.—The acquisition of this road by the Grand Trunk, it is stated, was by absolute purchase. Mr. Senecal and his associates having transferred seven-tenths of the entire capital stock to the Grand Trunk and agreed to procure and transfer the remaining three-tenths. The Grand Trunk pays \$5,000,000 in its bonds and \$250,000 in cash for this road, which originally cost the Senecal syndicate \$4,000,000, in addition to which they are said to have spent \$1,000,000 or thereabouts for land and terminal facilities at Quebec.

It is very probable that the Senecal party found the road somewhat of an elephant on their hands and that they were very glad to get rid of it, especially at a small profit. The road is worth more to the Grand Trunk than to anyone else—and the Grand Trunk could, if it saw fit, make it a very unprofitable piece of property to unfriendly holders.

Pennsylvania.—This company's statement for November shows for all lines east of Pittsburgh and Erie, as compared with November, 1881:

An increase in gross earnings of.....	\$533,610
An increase in expenses of.....	391,502
Net increase.....	\$142,018
For the eleven months ending Nov. 30, as compared with the corresponding period in 1881, the same lines show:	
An increase in gross earnings of.....	\$4,530,233
An increase in expenses of.....	3,493,838
Net increase.....	\$1,036,395

All lines west of Pittsburgh and Erie for the eleven months of 1882 show a surplus over liabilities of \$1,865,628, being a decrease, as compared with the same period of 1881, of \$874,380.

Pennsylvania Company.—The following circular from Third Vice-President and Comptroller Thomas D. Messler is dated Pittsburgh, Dec. 20, and announces an important change:

"On the 1st proximo the accounts of the following named roads operated by the Pennsylvania Company, viz.: Pittsburgh, Fort Wayne & Chicago Railway; New Castle & Beaver Valley Railroad; Lawrence Railroad; Erie & Pittsburgh Railroad; Meadville Railway; Ashtabula & Pittsburgh Railway; Alliance, Niles & Ashtabula Railway; Massillon & Cleveland Railroad; Northwestern Ohio Railway, and the Indianapolis & Vincennes Railroad, which have hitherto been kept separate, will be consolidated under the title of Pennsylvania Company Operating Department. "Separate reports of ticket sales over the roads of other companies, which have heretofore been made by the above named roads, will, after Jan. 1, be discontinued, and the same combined in one report. Other companies will also discontinue separate reports of ticket business to these roads, and consolidate the same in one report under the above named title."

"Monthly settlements of freight business interchanged between other companies and the roads named should be included in one account."

"Separate monthly reports for mileage of cars of the roads mentioned above will be required, but the aggregate amount of such reports should be carried to the credit of the Pennsylvania Company. Care should be taken to distinguish in this respect between the Pennsylvania Company and the Pennsylvania Railroad Company. In reporting mileage of foreign cars on our lines, the roads on which the mileage is made will be specified, and the total amount due placed to the credit of the company to which the report is made."

"Cars of the roads included in this arrangement are as follows: Pennsylvania Company, marked Pennsylvania Co.; Pittsburgh, Fort Wayne & Chicago Railway, marked P. F. W. & C. Ry.; Erie & Pittsburgh Railroad, marked E. & P. R. R.; Ashtabula & Pittsburgh Railway, marked Ash. & Pitts. Ry.; and A. Y. & P.; Northwestern Ohio Railway, marked N. W. O. Ry.; Indianapolis & Vincennes Railway, marked Indianapolis & Vincennes."

"Ticket, freight and mileage reports should be sent as heretofore, to James P. Farley, Auditor, Pittsburgh, Pa."

"Drafts for balances due other companies on the above accounts should be made on J. P. Henderson, Cashier, Pittsburgh, Pa., and for balances due this company drafts will be made by the undersigned, or the Assistant Comptroller."

"The Pennsylvania Company is also operator, under lease, of the Cleveland & Pittsburgh, and the Jeffersonville, Madison & Indianapolis railroads, and also owner and operator of the Union and National fast freight lines, the business of which is not included in the above arrangement. Officers of other companies will continue to report separately the business of the Cleveland & Pittsburgh Railroad to James Instan, Auditor, Cleveland, O., and that of Jeffersonville, Madison & Indianapolis Railroad to Geo. S. McKiernan, Auditor, Louisville, Ky. Freight reports connected with business of the Union Line and reports of mileage of Union and National Line cars should be addressed to John T. Denniston, Auditor, Pittsburgh, Pa."

Philadelphia & Reading.—The Philadelphia North American of Dec. 27 says: "It is reported, on what is claimed to be good authority, that Mr. Gowen, desiring to meet the objection of the holders of the Reading's junior securities that the consolidated mortgage is not sufficiently secured, seeing that \$53,008,700 of the first and second mortgages, consolidated seven and general mortgages are ahead of it, has decided to imitate the policy of the Pennsylvania railroad in issuing the Philadelphia, Wilmington & Baltimore 4 per cent. trust certificates. The Philadelphia, Wilmington & Baltimore fours are secured by 200,000 shares of Philadelphia, Wilmington & Baltimore stock deposited with the trustee of the \$10,000,000 loan. Mr. Gowen is credited with proposing to create a new 5 per cent. loan, distinct from the consolidated 5 per cent. loan to be secured by the stock which the Reading owns in control of the divisional roads, and to be exchanged for junior securities to such an amount as may be necessary to take the road out of the hands of receivers. It is believed that he has secured the consent of a sufficient number of junior bondholders to this plan to insure its success."

Rochester & Pittsburgh.—The directors have decided to issue the bonds of its new consolidated mortgage upon the Buffalo Division at the rate of \$20,000 per mile, in place of the first-mortgage bonds which it originally intended to issue upon that division. Holders of about one-half of the income bonds of the Rochester & Salamanca Division have agreed to exchange their bonds for the new consolidated bonds on the basis of two income bonds of \$1,000 each for one consolidated bond of \$1,000. All holders of income bonds who exchange on this basis on or before Jan. 15, 1883, will receive interest on the new bonds from the first of the present month. Those who make the exchange after Jan. 15, 1883, will receive interest from the date of exchange.

Sinaloa & Durango.—A Scotch company has purchased four haciendas, containing 1,300,000 acres in all, on the line of this road in Mexico, and purposes going into the stock-raising business on a large scale. The Mexican Central road also passes through a part of the property. The Durango plains, where these haciendas are mainly situated, are very fertile, and wheat and corn are grown there without irrigation.

Thomasville.—This company has been organized to build a railroad from Thomasville, Ga., on the Savannah, Florida & Western road, southwest to Tallahassee, Fla., a distance of about 35 miles. It will reach a large body of timber which is almost untouched.

Toledo, Cincinnati & St. Louis.—At a meeting of bondholders in Boston, Dec. 23, several statements were made as to the present and prospective value of the road, and its present necessities. The subscriptions for the new 8 per cent. preferred bonds were made up to \$600,000, and parties present agreed to be responsible for the remaining \$200,000 needed.

Vandalia, Hillsboro & Springfield.—This company has been organized to build a railroad from Vandalia, Ill., northwest to Hillsboro and thence north to Springfield. An extension from Vandalia south by west to the Ohio River, about 120 miles, is also proposed.

Wabash, St. Louis & Pacific.—This company's Des Moines Division—the Des Moines Northwestern road—is completed to the Illinois Central crossing at Ponda, Ia., 28 miles beyond the late terminus at Eads and 115 miles northwest of Des Moines. Trains will soon run through to the new terminus.

Western North Carolina.—Gov. Jarvis, of North Carolina, recently made an official inspection of the Ducktown Branch and reports its condition as follows: "The road from Asheville is completed to Pigeon River. The part that is ironed is in first-rate condition. The grading is completed to the top of Balsam Mountain, 18 miles from Pigeon River. From Pigeon River to the Balsam Mountain the grading is completed and to the Cowee tunnel, which is 16 miles further, the work is making fine progress and will be completed so far as the grading is concerned, by March 1. This work will include the Cowee tunnel, which is 800 ft. in length. This tunnel was just half completed Dec. 1. It is on the banks of the Tuckaseegee River, on the west side, and is through stone and earth. Much delay has been caused by the striking of soft material, which caved in so that an immense cut had to be made, then arched over and the dirt put back. This tunnel takes the road through Cowee Mountain, and then the line goes down the Tuckaseegee toward Charleston, Swain County, passing near that place and crossing the Tennessee River near the mouth of Nantahala. Then the line runs up the Nantahala to Red Marble Gap, cuts through the mountains and striking the headwaters of Valley River runs down that stream to Murphy. It will be observed that the Western road along almost its entire length follows the water courses, leaving the headwaters of one stream only to cut through a ridge and strike the headwaters of another stream. There are besides the convict quarters at the Balsam two others between that point and the Cowee tunnel, at which are in all about 425 convicts. The work on the road progresses constantly in good weather, but in bad weather the convicts are kept in their quarters."

